

# Southern Power & Industry

The Industrial and Power Journal of the

Southwest

University Microfilms  
313 N First St  
Ann Arbor Mich 4

Y, 1961

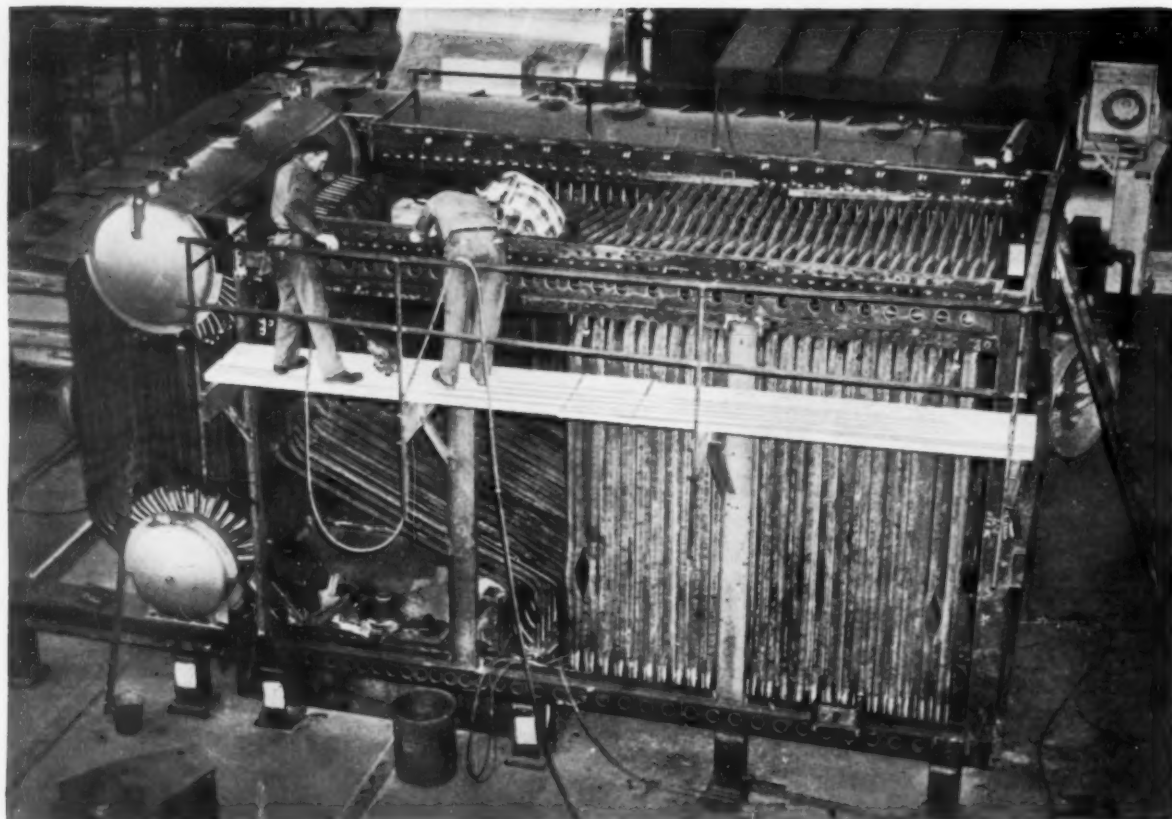
## Flexible System



A Plant Installation Report  
Electrical Distribution - - P. 29



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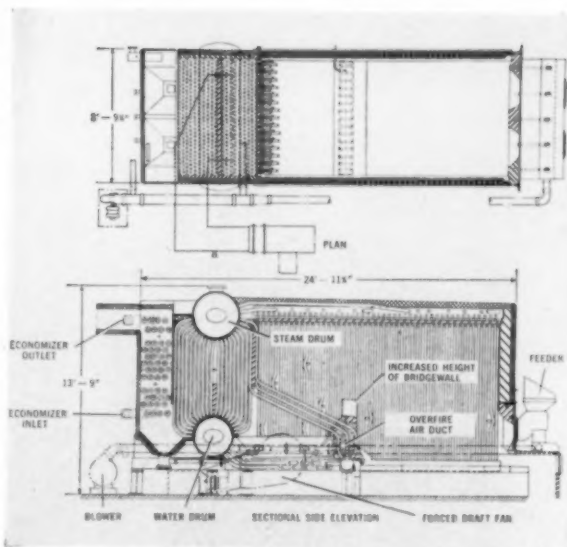
Stoker-fired boiler being shop assembled.

## Coal fuels this push-button packaged steam generator

Good news for industry in areas where coal is economical —FW stoker-fired *packaged* steam generators that are comparable with the most advanced gas and oil fired units. Engineered and built with precision, the design has been thoroughly proved and tested in more than two years of operation at full design capacity and above. Performance has been consistently better than expected under all operating conditions.

Units designed for semi-automatic operation are available in three standard sizes: 43,000, 50,000 and 63,000 lb/hr steam capacity at pressures to 250 psig. Push-button control brings these units on or off banked fire. They may be converted to oil firing in a matter of hours. And for easy handling and speedy low-cost erection, they are shipped in three major subassemblies, one of which is the complete boiler and economizer section shown above and at right.

For complete performance and descriptive data on FW stoker-fired packaged steam generators, request bulletin PG59-4. Standard oil and gas fired units are also available in capacities from 13,000 to 100,000 lb/hr. Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, New York.



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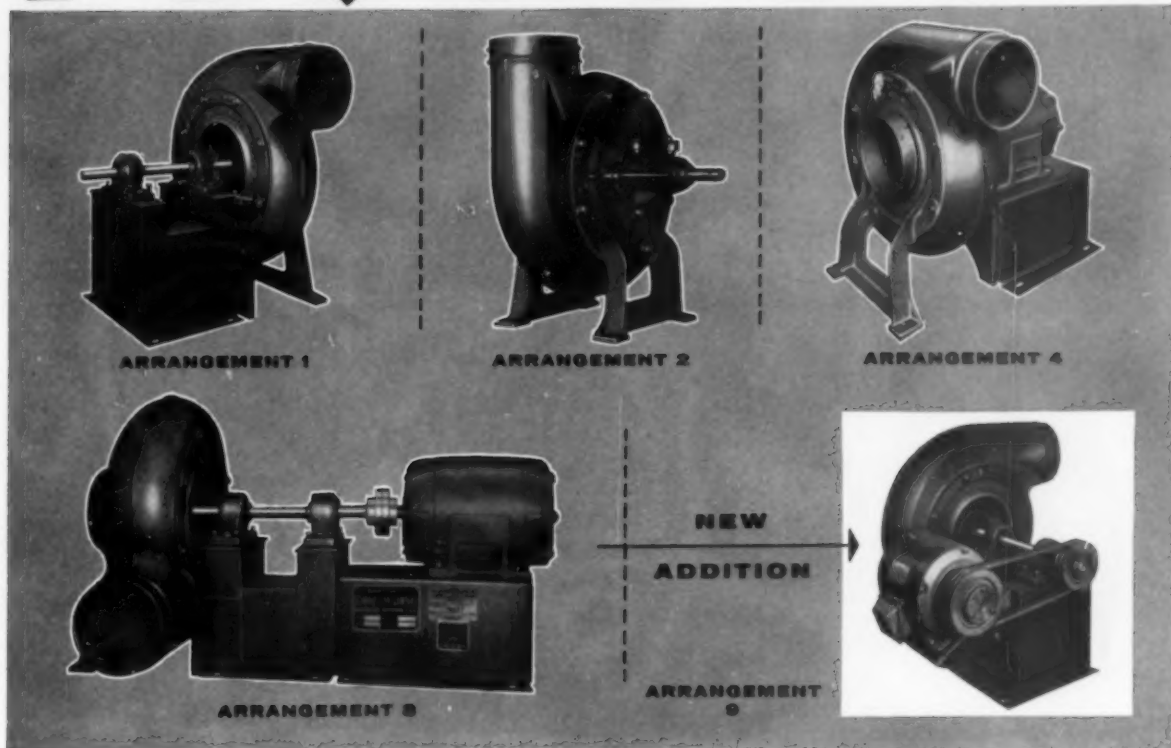
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SOUTHERN POWER & INDUSTRY is published monthly by W. R. C. Smith Publishing Co., Executive and Editorial Offices: 806 Peachtree St., N.E., Atlanta 8, Ga. Second-class postage paid at Charlotte, N. C. Subscription Rates: United States and Possessions, \$1.50 per year or two years for \$3.00; Foreign Countries, \$10.00 per year.

Volume 79

Number 2



## Presenting... *the new line of CLARAGE Type CI Exhausters*

Volumes to 3800 CFM, pressures to 18", temperatures to 750°F., six sizes, three wheel types, five arrangements as shown above, adjustable to any of the eight standard air discharge directions.

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woodworking, and other machines . . . conveying materials ranging from fibers to grains . . . removing smoke and fumes . . . furnishing industrial process air . . . handling chemical and hot gases.

Write for new Catalog 707 containing performance tables, dimensions, and system data. Get acquainted with the advantages you'll enjoy by choosing Clarage Type CI Fans for your next requirements. CLARAGE FAN COMPANY, Kalamazoo, Michigan.

*Dependable equipment for making air your servant*

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*Kalamazoo, Michigan*

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## **We re-designed the motors' End Bells and early bearing failures stopped!**

Here's another example of why it pays to work with our bearing engineers on every bearing problem.

Bearing failures were excessive on three h.p. gear reduction motors driving screw conveyors and elevators in a chemical plant. Our engineers determined that vibration, caused by light pressed steel End Bells, was responsible.

We re-designed the End Bells, had them cast in gray iron, and installed the proper anti-friction bearings which now give satisfactory service and life.

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# Southern Power & Industry

The Industrial and Power Journal of the South and Southwest

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burgh St., San Mateo, Calif. Tel. DIAMond  
3-8806.

Subscription Rate: 1 Year — \$1.50  
2 Years — \$3.00; Foreign — \$10.00

Published monthly by  
W. R. C. SMITH PUBLISHING CO.  
Atlanta, Ga., and Charlotte, N. C.

Publishers also of *Textile Industries*, *Electrical  
South*, *Southern Hardware*, *Southern Auto-  
mobile Journal*, *Southern Building Supplies*, and  
*Southern Farm Equipment*.

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Contents indexed regularly by Engineering Index, Inc.  
Copyrighted 1961 by W. R. C. Smith Publishing Company

Address all correspondence to  
Editorial and Executive Offices: **SOUTHERN POWER & INDUSTRY, 806 PEACHTREE ST., N. E., ATLANTA 8, GA.**

Printed in U. S. A.

SOUTHERN POWER & INDUSTRY for FEBRUARY, 1961

# **NOW! Fuses that...**

***Safely interrupt fault currents up to  
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***Hold 500% load for minimum of ten seconds***

Buss Low Peak fuses can completely revolutionize the protection of the entire electrical system.

Protect Mains, Feeders, Branch Circuits, Motors, Controllers, Switches—no matter whether the fault current is 1,000 amperes, 25,000, 100,000—or as high as 200,000 amperes.

Reduce stresses and prevent damage to Panel-boards, Switches, Motor Controllers—other circuit components—because let-thru fault currents are limited to exceptionally low values.

Prevent work stoppages, lights out, waste of time and money—because long time-lag keeps them from opening needlessly on motor starting currents or other harmless overloads.

Permit increasing interrupting capacity and current limitation on present system at minimum cost.

*Before designing a new  
installation—  
or modernizing old  
installations—*

## **GET ALL THE FACTS**



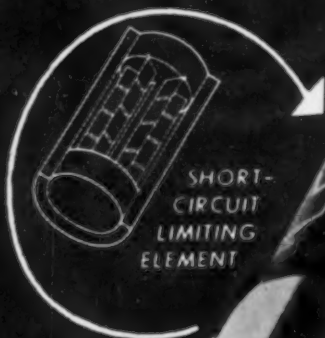
Knowledge without action is of little value—but ACTION NOW may save you money—increase operating efficiency and reduce electrical hazards to a minimum.

BUSS LOW-PEAK fuses fit standard Switches and Panel-boards and are available in N.E.C. sizes from 15 to 600 amperes in both 250 and 600 volt ranges.

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Company.....

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8/FI-381



# Facts and Trends

February, 1961

- ◆ **PROFESSIONALISM** — Need for better two-way communication is evidenced in a survey entitled "Engineering Professionalism in Industry." The survey may be obtained from the National Society of Professional Engineers, 2029 K St., N.W., Washington 6, D. C. Price \$4.00 to non-members; \$2.00 to members.

These are some of the findings reported — One out of four engineers in industry believes that engineers are thought of as second class professionals, but no industrial managers agree with this opinion — Sixty-one per cent of the engineers employed in industry think there is considerable mal-utilization of engineers, but only 30 per cent of industrial managers agree — More than half the engineers in industry think that higher pay would advance the engineering profession, but only 20 per cent of industrial managers agree.
- ◆ **FIBERFRAX** — A high temperature ceramic fiber insulation under development by Carborundum Co. for several years has cleared all the hurdles, and on January 1, 1961, was assigned as a standard product to the company's Refractories Division.

A mix of high grade alumina and silica sand is heated to 3900 F and poured in a molten stream. The stream is struck with a blast of air or spun into fibers of varying lengths that look like white wool. The fibers are fabricated into over 40 forms such as blocks, sheets, paper, textiles, blankets, rope, castables and molded forms. The light durable material withstands continuous operating temperatures up to 2300 F.
- ◆ **MORE ALUMINUM** — The aluminum industry in 1960 held at a high plateau, with consumption only slightly below the record levels of 1959, said R. S. Reynolds, Jr., president of Reynolds Metals Co.

Aluminum continued its steady pattern of breakthroughs in significant market areas. Nearly all the 1960-61 output of frozen orange juice concentrate will be packed in aluminum cans. Increased use of aluminum continued by the railway industry. Other applications which should continue to increase during 1961 include aluminum drill pipe for oil and gas wells, pre-enameled commercial aluminum building products, bridge, street and highway equipment, aluminum vehicles, equipment for military use and structures for the electrical industry.
- ◆ **TWO PELLETS PER MILE** — The initial shipment of \$9 million worth of nuclear fuel elements which will power the N. S. Savannah, world's first atomic merchant vessel, was made recently by Babcock & Wilcox Company's nuclear facilities plant at Lynchburg, Va.

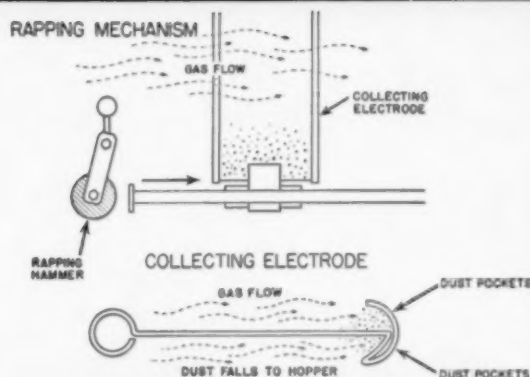
In all, 36 fuel elements will be delivered to the ship at Camden, N. J. Four elements will be "spares," while 32 will be assembled as the reactor "core," capable of propelling the Savannah 14 times around the globe, or 350,000 miles, without stopping. Each element weighs 760 pounds, and is 92 inches



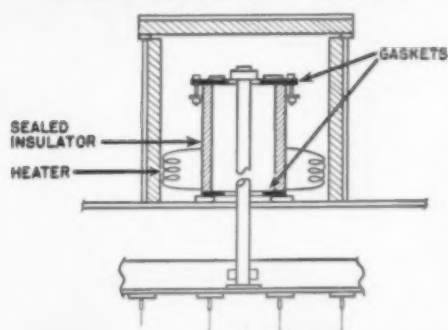
# SOME PLAIN FACTS

## ABOUT SUPERIOR PRECIPITATOR PERFORMANCE

Buell Precipitators are designed and constructed for rugged service and superior performance. Frills and internal trim-fram of a doubtful value are eliminated in favor of strength and simplicity. The casing, outside supports, and internal parts are of rugged construction; and the four-point suspension of emitting electrodes ensures the greatest stability. Here are just a few of the outstanding features of Buell Precipitators.



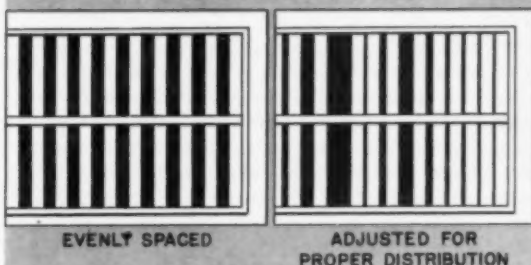
### SEALED INSULATOR COMPARTMENT



**Effective Continuous Cycle Rapping**—Yes, it's mechanical. A simple, rugged system free of complicated gadgets; assures positive dust shearing action. Each row of electrodes is rapped separately—in the direction of the gas flow—on a continuous cycle. Dust is sheared off, drops in an agglomerated mass and pockets on electrodes minimize reentrainment.

**Sealed Insulators Improves Operation**—High voltage quartz support insulators are completely sealed; prevents gas and dust leaking into insulator compartment and outside air leaking into precipitator. There is no need for costly ventilating systems. Thermostatically controlled electric heaters insure start-up without danger of moisture condensation and insulator breakdown.

### ADJUSTABLE BAFFLES



**Uniform Distribution of Gas Flow**—Field adjustment capability is vital. Buell's adjustable baffle permits final positioning after field measurement of actual flow distribution... because gas flow patterns are not entirely predictable. The Buell distribution system assures equal gas loading through the precipitator; eliminates ineffective "dead" areas around passages and prevents "sneak-by."



**Buell Spiralelectrodes cut maintenance to a minimum.** Buell's record stands at less than 1% replacement in this key area. Self-tensioned spiralelectrodes eliminate vibration and "off-center" swaying, often prevalent with weight-tensioned wires. They're structurally fixed and once installed stay in alignment. The spiralelectrode provides greater emission than straight wires.

Buell precipitators are simple and effective. They're designed for continuous service. You'll be glad you turned to Buell when you experience superior performance and low maintenance. Detailed literature describing all features is available.



The Buell Engineering Co., Inc., Dept. 80-A, 123 William Street, New York 38, N. Y. Northern Blower Division, 6422 Barberton Avenue., Cleveland, Ohio.  
 ■ Electric Precipitators ■ Cyclones ■ Bag Collectors  
 ■ Combination Systems ■ Fans ■ Classifiers.

# Stylux 20

BY BUTLER®

a revolutionary  
achievement in plastic  
panel quality



A 20-year guarantee for plastic panels! This is startling news. For since the original introduction of fiberglass panels, surface failures, with corresponding loss of color and translucency, have been the greatest deterrents to panel use. Now, a major technological breakthrough enables Butler Manufacturing Company to guarantee new Stylux-20 to maintain a uniform surface condition under normal use, for 20 years. The guarantee is in writing.

Look for this guarantee tag

**BUTLER MANUFACTURING COMPANY**

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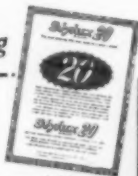
Send full details on both Stylux-20 and your unusual 20-year guarantee.

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CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_



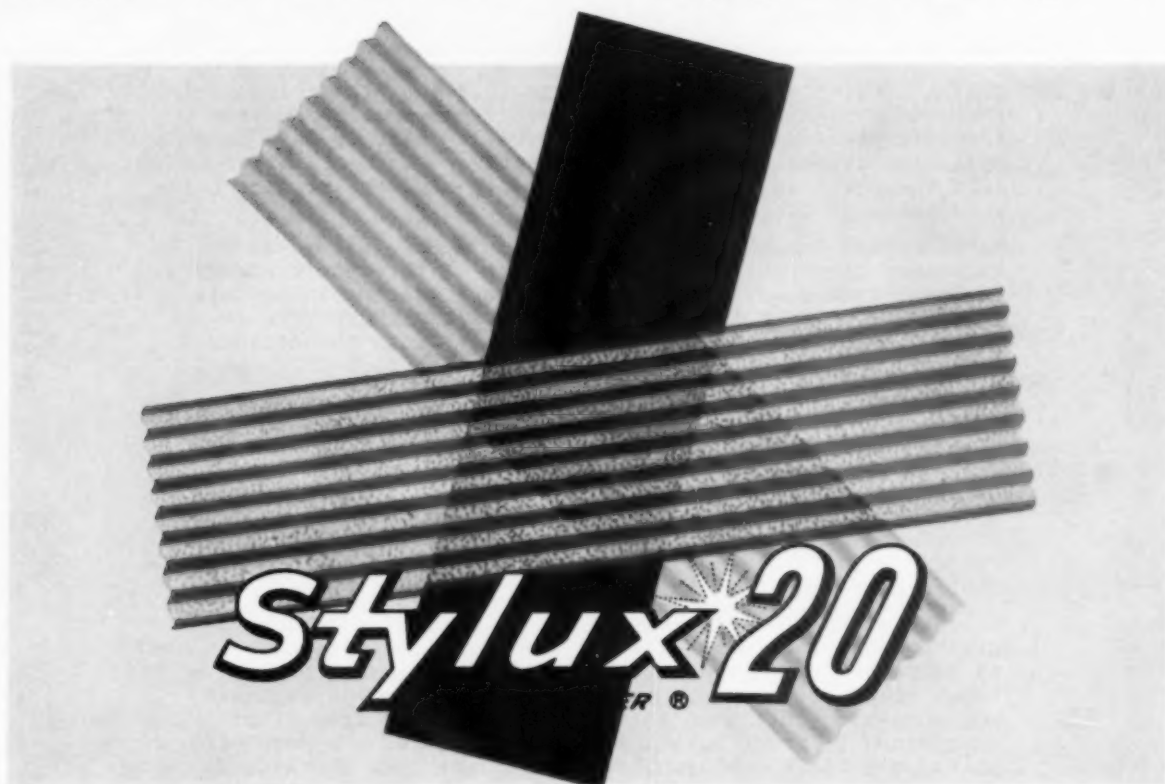
Stylux-20 is the lowest-cost glazing you can buy on a cost-per-year basis. Install it once and forget it. Stylux-20 is shatterproof. It has the unique ability to withstand the harshest weather without surface deterioration. Its clear hardness provides up to 90% light transmission when used for windows or skylights. And because Stylux-20 does not pit or erode, it's easy to clean . . . stays easy to clean.

New colors match Stylux-20 to the most modern factory . . . yet because of their rich, harmonizing tones, bring new life to older plants as well. Most important, panel color and light transmission characteristics are fully protected by the special Stylux-20 formula for the entire period of the guarantee.

You can use Stylux-20 in a variety of applications such as glazing, skylighting, sun shades, decorative partitions or translucent sidewalls . . . using it with complete confidence of full utility without repeated repair or replacement.

Well worth looking into. Specific details are yours for the asking. Use the convenient coupon, or write direct. Taking a few moments to examine Stylux-20 in detail . . . may well be worth many dollars in return.

You get excellent service and supply from  
**Reynolds Aluminum Supply Company on**



## Daylighting Panels

Diffused daylight streaming through colorful fiberglass panels brightens many a modern business. These panels can lower your cost of artificial lighting, and your Reynolds Aluminum Supply Company distribution center can lower your cost of purchasing them.

Excellent service, immediate supply . . . these are the cost-cutters your RASCO warehouses offer. Whether it's the practical beauty of fiberglass panels or an essential keg of nails, your plant or business can find the finest in materials and get the best in service from the complete stocks carried by all of the eleven Reynolds Aluminum Supply Company distribution centers across the Southeast.

*Each RASCO Distribution Center carries complete stocks of STYLUX 20 Daylighting Panels in all standard corrugations, colors and finishes including flat panels and glazing panes.*

Make your RASCO warehouse a "ONE-STOP" source of Stylux 20 and many other building materials.



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**LOUISVILLE, KY.**  
 7202 Boxwood Drive  
 EM 6-0314

**NASHVILLE, TENN.**  
 700 Harrison Street  
 AL 5-1152

## Facts and Trends (Continued)

long and 8.5 inches square. A single element contains 164 stainless steel tubes one-half inch in diameter, which contain the nuclear fuel in pellet form. There will be a total of 682,200 uranium oxide pellets in the reactor core.

- ◆ **INDUSTRY & ATOMICS** — Francis K. McCune told the Atomic Industrial Forum that significant steps in the development of nuclear electric power sources for space vehicles already have been made. And commenting on nuclear power for merchant ships, he said the world is now moving from paper studies into the hardware phase of the business.

He described industry participation in such projects as a necessary first step in the transition of the atomic energy business from a government monopoly to a reasonable private enterprise. "If it is the honest desire of industry to develop commercial aspects of this business with the attendant incentives and profits, we are the ones who must take the action which will insure this end."

- ◆ **SEE WHAT YOU DID** — Non-destructive testing of industrial products is finding new uses every day, according to John Reynolds, technical director of Picker X-Ray Corporation. One example of such an application is the inspection of the ultra-high-frequency radio beacons used in the nose cones of ICBM experimental missiles.

To enable the beacon to withstand the tremendous shock and heat encountered in re-entering the earth's atmosphere, it has to be potted, in a special fluid which when baked becomes a tough solid covering. Using the Picker Hotshot, a portable suitcase-size unit used to inspect everything from atomic submarines to truck tires, two x-ray pictures are made of each potted missile assembly. The pictures are then checked for wiring accuracy, short circuits, broken terminals and other faults before shipment.

- ◆ **POSSUM TROT** — Industry's first harnessing of aircraft jet thrust took place at Possum Trot, Kentucky, recently where a specially designed gas turbine, using an adapted jet engine, is now pumping about 600 million cubic feet of natural gas a day in the pipe line compressor station of the Columbia Gulf Transmission Company.

A revolutionary prime mover, the RT-248 gas turbine develops 10,500 rotative horsepower and weighs 34,000 pounds, about one-sixth the weight of a conventional gas turbine unit. Designed by The Cooper-Bessemer Corp., the new gas turbine uses as its heat energy source a Pratt & Whitney Aircraft J-57 jet engine, adapted to run on natural gas.

- ◆ **PIPING CHARTS** — To help engineers reduce piping engineering time, The W. M. Kellogg Company has just completed a new printing of "Pressure Drop for Flow of Fluids in Round Pipe." The 160-page volume is a compilation of detailed pressure drop charts that present ready solutions to pressure drop relationships for both liquids and gases as a function of the variables specified by the commonly known Fanning equation.

The book of charts is a useful tool for relieving the tedium associated with line sizing for complex and extensive design projects. Available at \$7.50 per copy. Write Mr. Leo Friend, The M. W. Kellogg Company, 711 Third Ave., New York 17, N. Y.



- ◆ REPRINTS AVAILABLE — Write the editors of SPI for small quantities of the following at no charge:

SESCO 1,000,000 KW PLANT — A 16-page folder describing this large new Alabama plant, serving Alabama Power Co. and Georgia Power Co., is a combination of two technical articles from SPI's September and November issues.

HOW EPOXY CAN SERVE YOU — 4 pages. Tells exactly how 10 separate repair jobs were handled and describes several epoxy mixes that are good for maintenance jobs.

ORIFICE METER INSTALLATIONS — Tells what the plant man needs to know about installation to get accurate, dependable service.

INSPECTION REPORTS — Tells how the station chemist can maintain information on the condition of boilers, cooling towers, condensers, heat exchangers, tanks and softeners. Actual inspection sheets are presented.

- 
- ◆ CAT'S PAW — A contract for development of a manipulator system to be used in remote handling of rocket fuels and rocket motors has been awarded to General Mills by The Dow Chemical Company. The manipulator system is to provide the remote handling capability required by Dow in assembling and testing experimental solid propellant motors.

In a typical test, the propellant might be poured into a motor casing and cured at slightly elevated temperatures. A rocket nozzle then would be attached to one end of the casing and an igniter to the other. These operations would be accomplished within a test cell — all by remote control. The assembled motor must then be transported to the test firing area and attached securely to a test stand. These operations also will be performed by the manipulator system.

- ◆ WEST FLORIDA — Tampa Electric Company's Industrial Development Department has announced the publication of a series of informative industrial survey booklets on communities in its West Central Florida service area.

Individual surveys are available on Tampa, Winter Haven, Plant City, Auburndale and Dade City. The booklets are available upon request to Industrial Development Department, Tampa Electric Company, P. O. Box 111, Tampa 1, Florida.

- ◆ VACUUM STEEL — The National Forge Company of Irvine, Pa., has begun production of its D-H vacuum steel, having successfully treated three heats on the first day of operation. This advanced vacuum process is designed to remove gases from the steel, while simultaneously providing a means of alloying under vacuum. Early heats show a marked reduction of hydrogen and oxygen, and accurate chemical analysis. The usual pick-up of nitrogen between melting and pouring has been avoided.

The vacuum unit, never before used by an American forging company or for processing electric furnace steel, was designed and built by the Lectromelt division of McGraw-Edison Company, based on recent development work by one of Germany's largest steel producers. National Forge claims the system has several advantages over earlier similar processes. Alloying and de-oxidizing additions are made under vacuum.

Write the editors for additional information on any of the above items.  
SOUTHERN POWER & INDUSTRY. 806 Peachtree St., N.E. Atlanta 8, Ga.



# the SOUTH—SOUTHWEST

more power . . . more plants . . . more money



Above: Reynolds Aluminum Supply Co.'s New Atlanta Plant.  
Below: RASCO's New Jacksonville Facility.



## Two RASCO Plants Open

Two new metals and building products distribution centers have been opened by **Reynolds Aluminum Supply Company** recently. In Jacksonville, Florida, the new 40,000 square foot plant replaces a smaller building on East Eighth Street. In Atlanta, the new facilities providing some 50,000 additional square feet are occupied entirely by the Warehouse Division's Atlanta Branch. The original 80,000 square foot plant will continue to house the expanded Colweld fabricating division.

"These are completely modern buildings," said Paul H. Fox, President, at the firm's Atlanta headquarters. "They are equipped with overhead cranes, inside rail and truck docks, truck leveling elevators, pre-engineered storage systems and all of the most up-to-date materials handling facilities."

Both buildings, like all of the plants covered by the company's expansion and modernization program, are all aluminum clad.

The company recently announced the appointment of Walter J. Gans, Jr., as sales manager of the

Warehouse Division.

In his new capacity, Mr. Gans will direct the company's general product group in promoting the sale of metals and building products.



Walter J. Gans, Jr.

Mr. Gans, who is a highly trained marketing expert, is a graduate of the Harvard Business School. After several years with Reynolds Metals Company in various sales and promotional capacities, he joined RASCO early in 1955 as advertising manager. In 1958, he took over the company's Richmond Branch and turned it into the most efficient pro-

ducer in the system. He is a native of Richmond but will make his home in Atlanta.

## New S. C. Plant for Argus Cameras Division

Argus Cameras Division of **Sylvania Electric Products Inc.** has started construction of a 109,000 square-foot projector plant at Platt Springs Road and Watling, Columbia, S. C.

The new plant is scheduled for completion in August, 1961. It will be devoted to the production of slide projectors and 8mm motion picture projectors. Approximately 400 men and women from the Columbia area will be employed at the plant when full production is reached.

At the groundbreaking ceremonies, Clinton H. Harris, president of the Argus division, said that "by utilizing the latest techniques in the mechanization and integration of manufacturing processes at the Columbia facilities, Argus intends to maintain its reputation for competitive values in the projector field. The ultimate freeing of manufacturing space at our plant in Ann Arbor, Mich., will enable us to expand photographic, optical and government business in the future by adding new products."

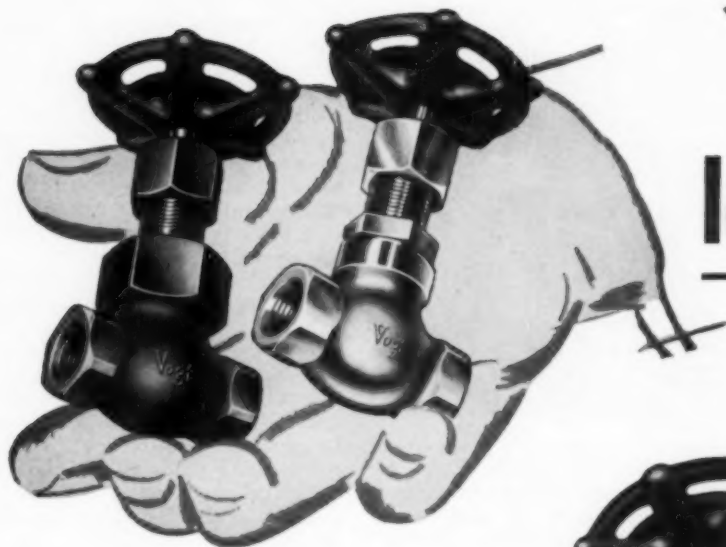
## New Plant Equipment For Carling — Atlanta

An \$800,000 investment in additional production facilities at the Atlanta plant of the **Carling Brewing Company** has been announced by Charles E. Landreth, Southeast regional vice-president and general manager of the Atlanta plant.

The new facilities will more than double the current can production capacity and will include the "latest and most modern equipment available for high-speed beer packaging," Mr. Landreth said. The Atlanta plant is the second in the brewing industry to install these im-

*New* **higher quality**

*New* **lower price**



Enlarged production facilities combined with improved manufacturing techniques enable Vogt to pass on the effected savings to our customers.

Service proved — these valves have always been a standard of quality for meter and gauge line service. You no longer need to compromise for less because of price! Send for Folder GP-9 giving specifications and engineering data on both globe and angle types, forged from stainless or carbon steel for every meter and gauge line service.

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**HENRY VOGT MACHINE CO.**  
**Louisville, Kentucky**

SALES OFFICES: Camden, N. J., Charleston, W. Va., Chicago, Cleveland, Dallas, Los Angeles, New York, St. Louis.

**Vogt**

**VALVES**

## News of the South-Southwest — more power . . . more plants . . . more money

proved packaging facilities and is the first of Carling's six plants to incorporate the system.

A new Hi-Speed production line will have a rated capacity of 1,000 cans per minute, and an Anderson cell-bin can receiving system will be installed. With this new system, no handling or warehousing is required for cans before they are used. The cans are fed directly into the production line when they are delivered from the factory. New six-pack machines take the cans when they are filled and sealed and place them in cartons, then seal the cartons without the use of glue.

Other pieces of new equipment will include a Meyer 72-spout can filler; an American 8-R closing machine; a Barry-Wehmiller pasteurizer; a Mead-Atlanta Cluster-Pak; Jones tray-pak and loose-pak and Alvey palletizing equipment.

Modification of the Atlanta plant to incorporate the new facilities began in November 1960, and the first pieces of equipment began arriving in mid-December. Full-scale use of the system is expected by May 1, 1961. The plant has a production capacity of 500,000 barrels per year.

### Anheuser-Busch Plant Expansion — St. Louis

A new expansion program to increase the production capacity of the St. Louis plant of **Anheuser-Busch, Inc.**, by 20 per cent was announced recently.

The program estimated at \$20,000,000 will begin immediately with completion scheduled for 1962. Present capacity of the St. Louis plant is 6,000,000 barrels a year. When the program is completed, the plant will have a shipping capacity of 7,300,000 barrels a year.

The modernization program includes practically every phase of the brewing, packaging and shipping operations of the company. Plans call for construction of a new stock house, lager and fermenting cellars, and improvements of Brew House operations. Extensive improvements in the canning and bottling departments will make it possible to handle an additional 427,000,000 twelve-ounce bottles and cans annually. The loading docks will be enlarged and truck loading shipping capacity will be increased.

### Plastic Exhaust System

One of the world's largest single plastics installations, a 125-foot exhaust system, has been completed by the **Corrosion Treatment Corp.** of Byesville, Ohio. A major steel company will be using this exhaust system, and another just like it, for



the removal of corrosive fumes from its zinc and tin plating lines. A quarter-inch corrosion resistant plastic sheet, calendered of a tailor-made compound, was supplied by the **Seiberling Rubber Co.** Plastics Division for the manifold, which ranges in

diameter from 22 inches at one end to 42 inches at the other.

### Universal Atlas Cement Plant Built by Rust

A new cement distribution station of the **Universal Atlas Cement Division** of United States Steel is being built in St. Louis, Missouri, by The Rust Engineering Company.

Sliding form construction of reinforced concrete walls will be employed for four silos with 50,000-barrel capacity for loose cement. A separate, one-story, prefabricated steel building provides for sack storage of cement.

Construction started in January on the bulk loading station, which will service the St. Louis market from the Universal Atlas Plant at Hannibal, Missouri. The project site is on Brooklyn Street, between First and Tyler, next to the Mississippi River. Cement will be brought in by railroad to a siding by the silos and by barge to unloading facilities at the river and then piped to the storage silos.

Completion is scheduled for June of 1961.

### PLANT PERSONNEL

**H. Ralls Jennings**, a mechanical engineering graduate of the University of Alabama, has been appointed plant engineer for Fulton Cotton Mills, Atlanta, Georgia. Mr. Jennings has had several years' experience with a Southeastern textile mill, prior to his new engineering post.

**Henry H. Douglas** replaces **William J. Timberman, Jr.**, as manager of the East Point, Georgia, factory of Pittsburgh Plate Glass Company's Paint and Brush Division. Mr. Timberman has retired after 20 years of service with the company. Mr. Douglas was transferred to East Point (Atlanta) in October as assistant manager.

**James A. Wilkerson**, formerly industrial relations supervisor at Bowaters Southern Paper Corporation in Calhoun, Tenn., has been promoted to assistant personnel manager. Mr. Wilkerson, who was graduated from the University of Tennessee with an industrial management de-

gree, joined Bowaters Southern in 1955.

**A. J. Skaale**, a recently elected vice-president of Carolina Power & Light Company, Raleigh, N. C., heads the operating and engineering department.

**George C. Davis**, formerly acting chief engineer of Bowaters Engineering & Development Inc., has been appointed chief engineer. Before he joined Bowaters in 1955, Mr. Davis was associated with Coats & Clark at Toccoa and Albany, Ga., and with International Paper Co. in Natchez, Miss., and Mobile, Ala. He is a mechanical engineering graduate of Georgia Tech.

**R. W. Holman** is now director of engineering for United States Steel's Tennessee Coal & Iron Division at Fairfield, Ala., having been promoted from his previous position as chief engineer. He succeeds **Norman C. Michels**, who has been transferred to Pittsburgh.



## News of the South-Southwest — more power . . . more plants . . . more money

### G.E. Award — Atlanta

Dan C. Kyker, electric utility sales representative for the **General Electric Company** at Atlanta, Ga., has received the "Carter L. Redd Award" for "outstanding human and professional contributions and unselfish service to his associates and the company."



The award — a certificate and three shares of G-E stock — was established in 1957 by C. L. Redd, Southeastern regional vice-president, for employees engaged in capital goods business in the seven-state Southeast area. It is offered annually to the employee who, in the opinion of a regional selection committee, has rendered conspicuous service to the community and to the company.

Mr. Kyker, a 1946 graduate of Georgia Tech, has been active in Atlanta civic affairs since his assignment here in 1955. An immediate past president of the Atlanta Jaycees, he has served in top posts for the Georgia Section, AIEE; the Greater Atlanta Georgia Tech Club; Atlanta United Appeal; Junior Achievement and the Georgia Engineering Society.

### NACE Elects Southerners

New officers for the **National Association of Corrosion Engineers** have been elected for 1961-62. E. C. Greco, senior research chemist for the United Gas Corp., Shreveport, La., has been elected president; Roland McFarland, secretary and technical director of Hills-McCanna Co., has been elected vice-president; and C. G. Gribble, Jr., district manager for the Metal Goods Corp., Houston, has been re-elected treasurer. All officers will be installed March 17, the last day of the association's 17th Annual Conference and 1961 Corrosion

### FUTURE EVENTS of Engineering Interest

**Feb. 13-16: 15th International Heating & Air Conditioning Exposition.** International Amphitheatre, Chicago, Ill. American Society of Heating, Refrigerating & Air Conditioning Engineers, National Meeting. International Exposition Co., 480 Lexington Ave., New York 17. E. K. Stevens, Mgr.

**Feb. 24: South Louisiana Regional Meeting.** Natural Gasoline Assn. of America, Lafayette Petroleum Club, Lafayette, La. Wm. F. Lowe, Exec. Dir., 421 Kennedy Bldg., Tulsa 3, Okla.

**March 5-7: Southern Safety Conference & Exposition.** Atlanta Biltmore Hotel, Atlanta, Ga. W. L. Groth, Exec. Dir., Box 8927, Richmond 25, Va.

**March 15-17: 40th Annual Convention.** Natural Gasoline Assn. of America, The Baker Hotel, Dallas, Texas. Wm. F. Lowe, Exec. Dir., 421 Kennedy Bldg., Tulsa 3, Okla.

**April 5-7: AIEE Southeast District Meeting.** Jung Hotel, New Orleans, La. Sec'y American Institute of

Electrical Engineers, 33 West 39th St., New York 18, N. Y.

**April 12-13: AIEE Materials Handling Conference.** Hotel Sheraton, Philadelphia, Pa. H. A. Zollinger, Chm. AIEE Materials Handling Subcommittee, Westinghouse Electric Corp., Pittsburgh, Pa.

**April 19-21: 7th Southeastern Regional Conference & Instrument Exhibit.** Instrument Society of America, Park Center & Public Library, Charlotte, N. C. Eugene B. Finch, Exhibit Chairman, Rt. 2 —Box 673C, Charlotte 9.

**April 28: Oklahoma Regional Meeting.** Natural Gasoline Assn. of America, Lake Murray Lodge, Ardmore, Okla. Wm. F. Lowe, Exec. Dir., 421 Kennedy Bldg., Tulsa 3, Okla.

**May 19: Permian Basin Regional Meeting.** Natural Gasoline Assn. of America, The Lincoln Hotel, Odessa, Texas. Wm. F. Lowe, Exec. Dir., 421 Kennedy Bldg., Tulsa 3, Okla.

Show at Buffalo, N. Y. They will serve for one year.

Directors elected are: Frank E. Kulman, senior engineer, Consolidated Edison Company of New York, Inc.; L. W. Gleekman, supervisor of the materials engineering group, engineering department of Wyandotte Chemicals Corp.; and Fred D. Stull, superintendent of corrosion prevention, Texas Gas Transmission Corp., Owensboro, Ky.

Mr. Greco has served as vice-chairman and later chairman of the NACE Technical Practices Committee. He is active in other scientific organizations, having been president of the Louisiana Academy of Sciences and state director of Louisiana Science Fairs which he organized in 1957.

Mr. Gribble is now in his first term as treasurer. He has served on the board of directors, was chairman of the 1952 annual conference, was co-chairman for exhibits at the 1957

conference and is a past chairman of the Houston Section.

Mr. Stull has been chairman of the Southeast Region, and has been a member of NACE since 1946. He has been associated with Texas Gas Transmission and its predecessor companies for 30 years. He attended Austin College, Rice Institute and Georgia School of Technology.

### CP&L Will Power New VOA Station

**Carolina Power & Light Company** will supply power for the world's strongest voice of freedom — the Voice of America transmitter station to be built at Shermardine near Greenville, N. C.

Facilities for doing the job also will serve one of the region's leading industrial tenants, the DuPont nylon plant near Kinston.

(Continued on page 21)

# POWELLFUL PERFORMANCE!

Powell pressure seal valves have been proved to control high temperatures and pressures in modern industries. More than 10,000 Powell pressure seal valves in installations on many continents have proved themselves to be precision-built, precision-tested, precision-performing.

This is just another example of Powell's

unfailing quality as leading industrial valve supplier of the world. Let Powell's 115 years of valve manufacturing experience go to work for you.

So always look to Powell to solve your valve problems and fill your valve needs. Talk to the Powell valve distributor in your city. Or contact The Wm. Powell Company—TODAY!



48-pound Steel Pressure Seal  
"Y" Globe Valve—Fig. 16031 W.E.  
Pressure Seal Steel Globe  
Valves are also available for  
900 and 1500 pounds pressure.



1500-pound Steel Pressure Seal Gate  
Valve—Fig. 11203 W.E. 6in., 8in. and  
2500 pound pressure seal gate valves  
can also be furnished.



150-pound Steel Pressure  
Seal Horizontal Lift Check  
Valve—Fig. 11305 W.E. Also  
available for 900 pounds.  
This design assures maximum  
flow through with minimum  
pressure drop and turbulence.

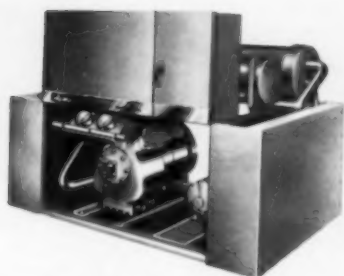
*115th year of manufacturing industrial valves for the free world*

## POWELL PRESSURE SEAL VALVES

THE WM. POWELL COMPANY CINCINNATI 22, OHIO



With Texas' TEMCO  
it's **Acme**  
packaged chillers  
time and time again



Flow Cold packaged water chillers—  
3 through 30 tons

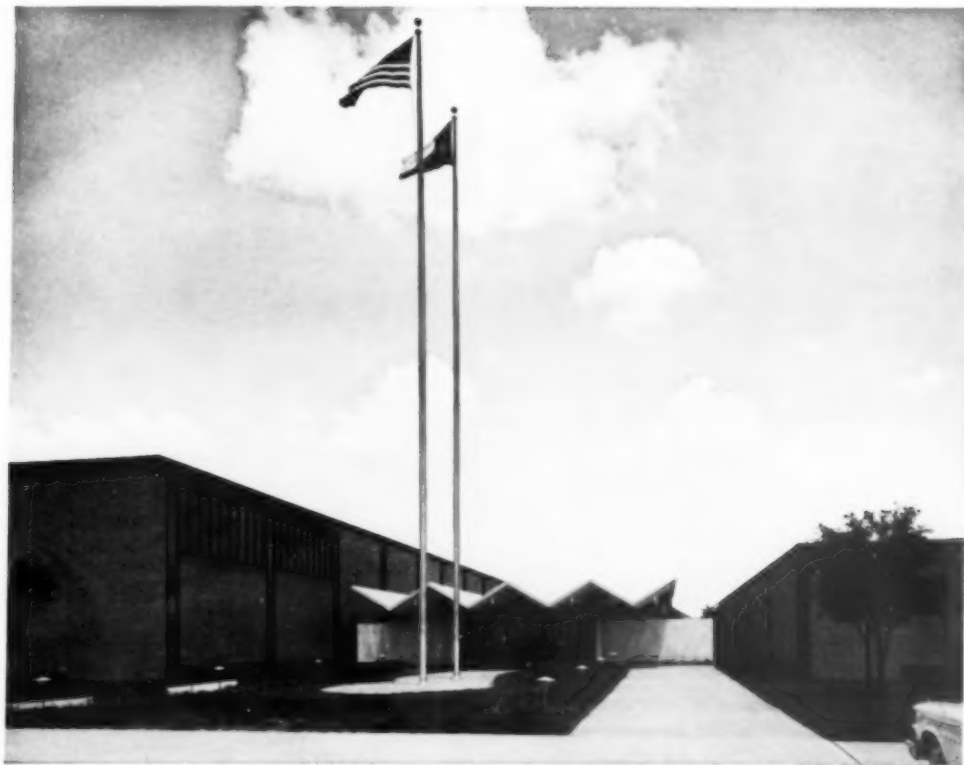
Started back in '51 . . . TEMCO Aircraft Corporation, Dallas, purchased two Acme packaged chillers to solve a problem in their spot welding operations. The problem? . . . the copper contact points of the spot welders melted and distorted without fusing the steel into an acceptable bond. The solution? . . . to circulate *cold* water through the hollow copper points to keep them cool, thus allowing the electrical charge to pass through the steel and weld without melting the copper.

To supply the cold water, Acme chillers were purchased . . . because they offered easy-to-install, space-saving compactness, high capacity efficiency, factory certified performance reliability. Was TEMCO satisfied? Well, as their manufacturing facility expanded and they needed additional chillers for spot welding and other processing operations, they came back to Acme *time and time again* . . . in July '53, March '55, June '57 and August '58, to be exact. What better evidence of customer satisfaction?

**Acme** INDUSTRIES, INC.  
JACKSON, MICHIGAN • GREENVILLE, ALABAMA

*Manufacturers of quality air conditioning and refrigeration  
equipment since 1919*

Administration and  
Engineering Building  
TEMCO Aircraft Corp.  
Garland, Texas

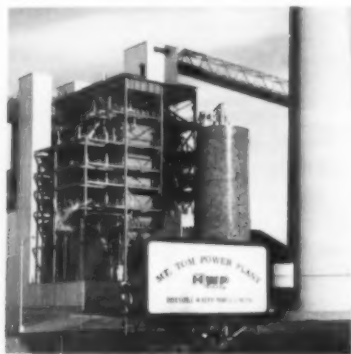




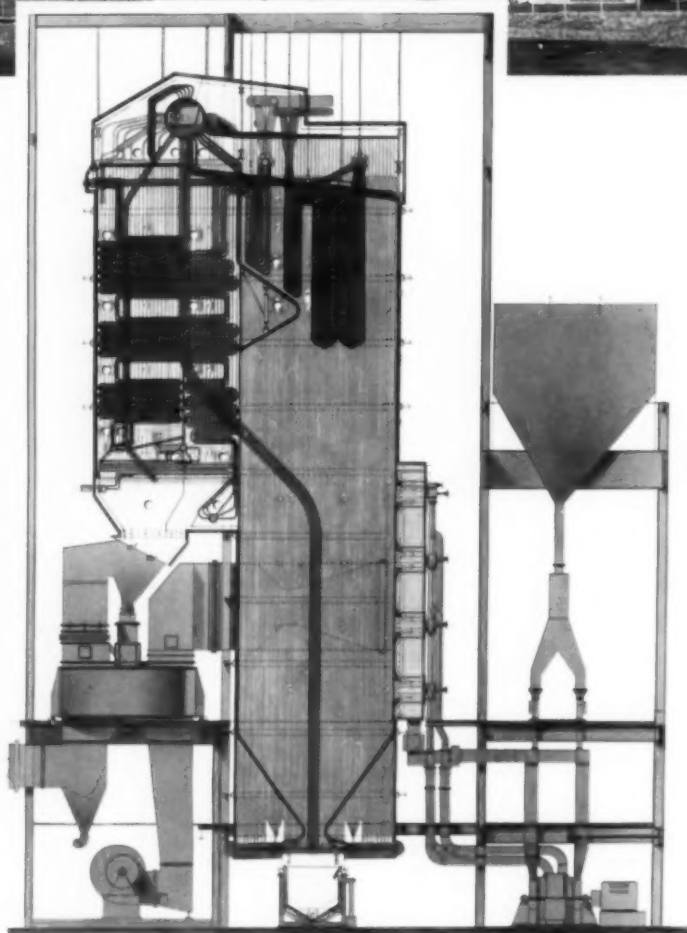
## MOUNT TOM POWER PLANT

Holyoke Water Power Company

Mount Tom Power Plant, paradoxically located in a region rich in ancient geological formation and prehistoric lore, is a symbol of modern American engineering achievement. The Riley Boiler is one of the most northern boilers in New England featuring outdoor construction.



**Mt. Tom Power Plant's Complete Riley Reheat Coal Fired Boiler**  
 Steam Capacity — 950,000 lbs/hr  
 Superheat/Reheat Temp. — 1000/1000 F  
 Pressure at Boiler — 1950 psig  
 Fired by low grade strip mine coal pulverized in four Riley Duplex Pulverizers.  
 Sixteen Riley Burners.



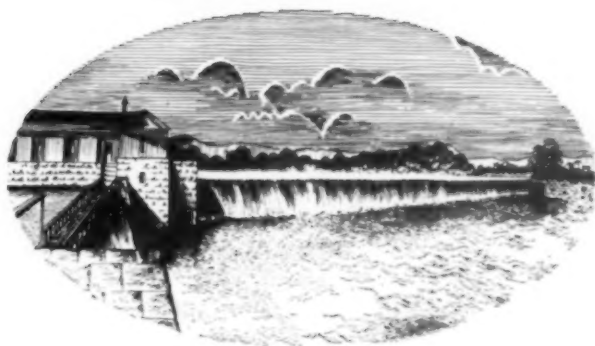
**RILEY STOKER CORPORATION • WORCESTER, MASS.**

**Sales Offices:** Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Jacksonville, Kansas City, Los Angeles, New Orleans, New York, Philadelphia, Pittsburgh, Portland, St. Louis, St. Paul, Salt Lake City, San Francisco, Seattle, Syracuse.



powering community  
progress for over a  
century

1849-1960



## Holyoke Water Power Company Installs a 950,000 lb/hr **RILEY** Outdoor Type Reheat Boiler at Mt. Tom

Over a century ago Holyoke Water Power Company built a dam across the Connecticut River and a network of canals that provided power for the industries that made Holyoke, Massachusetts famous as a leading New England industrial center. Mt. Tom Power Plant located on a choice site for furthering industrial development can carry on this tradition for years to come. The new steam-electric plant with its capacity of 137,500 kilowatts brings Holyoke Water Power Company's total generation to 229,000 kilowatts. The Mt. Tom plant also supplements existing steam and hydro-electro facilities and provides a dependable source of power when hydro-electric power is reduced by insufficient river flow. Water for the 950,000 lb/hr Riley boiler comes from two never-failing wells at the plant site.

**JACKSON & MORELAND, INC.**  
Consulting Engineers

*Riley offers a complete line of boilers from package unit sizes to the largest central station types. The Riley line of fuel burning equipment offers a wide selection for solving virtually any fuel burning problem. Before you make any decision on new facilities talk to your Riley Representative.*

*A careful survey of your plant by a qualified consulting engineer could show ways of making substantial savings in power costs.*



Four Riley Pulverizers efficiently pulverize over 1300 tons of high ash content coal per day. A high degree of fineness is continuously maintained by long wearing tungsten carbide faced pulverizing elements. Operation is vibrationless and quiet. Flash drying feature permits use of unusually wet coal.



# RILEY

STEAM GENERATING & FUEL BURNING EQUIPMENT

# Armco Retaining Wall Saves Ground, Hides Tanks

New steels are  
born at  
Armco



Behind this Armco Retaining Wall are 16 horizontal storage tanks. Even during erection, the wall did not interfere with adjacent railroad.

Interchemical Corporation, Finishes Division, Cincinnati, Ohio, had to install more storage tanks for their industrial finishes—but did not want to sacrifice needed land. An all-metal Armco Bin-Type Retaining Wall helped solve the problem.

Because the site was on sloping ground and the lowest part was unoccupied, an Armco Wall proved the ideal solution. It made use of available land without encroaching on the adjacent railroad. Behind this wall, in an excavated

area, 16 storage tanks were installed horizontally—including four that previously had been installed upright.

Earth was then placed over the installed tanks, and the entire area paved. Now, not only are the 16 tanks out of sight but the surface above them has been conserved for future use.

Write us for a copy of the new Armco Retaining Wall catalog, Armco Drainage & Metal Products, Inc., P. O. Box 1343, Atlanta 1, Georgia.

**ARMCO** Drainage & Metal Products



for strength,  
durability,  
economy



Beginning of erection of the Armco Bin-Wall. Upright tanks at left and others at right were installed behind this wall.

## Southern News Briefs

(Continued from page 15)

H. B. Robinson, CP&L vice-president and general manager, said that CP&L has agreed to supply 6500 kilowatts to the VOA station and 2800 kilowatts to the DuPont plant.

These power loads will travel over a 70-mile transmission line now being built between the company's Goldsboro steam-electric generating plant and New Bern.

Mr. Robinson said plans of these two industries to tap the line speak for its role as a major new power source in the industrial development of Eastern North Carolina.

Through interconnections at New Bern, the new line will allow two-way service of the entire region from either the Goldsboro plant or the L. V. Sutton steam-electric plant at Wilmington. (A new generating unit is being constructed at Goldsboro to more than double the plant's size.)

August 1, 1961, is target date for the line's completion. Construction crews are erecting the first of some 500 H-frame pole structures to carry the 110,000-volt conductors, each of which will measure over an inch in diameter.

The line will pass just a few miles north of the DuPont plant and south of the VOA site. Tap lines will extend from the main line to points of delivery where 110,000-volt substations will be built to step down power to lower voltages.

CP&L will have power available to the DuPont plant by September 1, 1961, and to the VOA station six months prior to its start-up date in 1962.

The VOA installation will be the world's strongest transmitting facility. There will be two transmitter stations, one at Shelmerdine and the other a few miles north at Pactolus. The Pactolus station will be served by **Virginia Electric and Power Company**. A receiving station will be located just west of Greenville.

Contracts totaling \$12 million were awarded by the U. S. Information Agency to two Texas firms for construction of buildings and towers. The entire project is expected to cost \$25 million.

The two stations will be designed for simultaneous or alternate broadcasting. Their six 500-kilowatt, six 250-kilowatt and six 50-kilowatt transmitters will give VOA a strong signal to Europe, Africa, the Middle East and South America.

The North Carolina project will

replace transmitters at Bound Brook and Wayne, N. J., and Brentwood and Schenectady, N. Y.

### Armco—Baltimore

Robert W. Martens has been named manager of the Eastern Division, **Armco Drainage & Metal Products, Inc.**



Mr. Martens succeeds T. M. Neibling, who is retiring. Formerly assistant manager of the division, he will continue to be located at the headquarters in Baltimore, Md.

### Clark Bros. — W. Tex.

**Clark Bros. Co.**, Division of Dresser Industries Inc., Olean, N. Y., has announced the appointment of A. J. Foster as parts salesman and service



supervisor for the Dallas-Midland (Texas) District. Mr. Foster's headquarters will be in Albuquerque, New Mexico. He will serve the oil, gas and petrochemical industries in the surrounding territory.

### Diamond Alkali — S.E.

In line with a long-range plan to broaden district office responsibilities, **Diamond Alkali Company's** Southeast District office at Memphis, Tenn., has absorbed the St. Louis

branch office.

R. B. Perry, Southeast District Manager, has assumed responsibility for the newly expanded district.

The St. Louis staff will continue to serve customers in the Kansas City and St. Louis areas.

### A. M. Clark Joins H. Clay Moore — Ga.

Arthur M. Clark has joined **H. Clay Moore & Associates Inc.**, 3110 Maple Drive, N.E., Atlanta, Georgia, representatives of several leading manufacturers of power plant equipment in the Southeast. Mr. Clark, who has been Chief Engineer of Custodis Construction Company, Inc. of New York, was graduated from New York University in 1939



with a degree of Bachelor of Civil Engineering.

He then joined Custodis and, except for a break during World War II, has served there as a draftsman and then as an engineer. He entered the Corps of Engineers in 1941 as a Second Lieutenant and was separated early in 1946 as a Lieutenant Colonel.

Custodis specializes in the design, construction and maintenance of radial brick and reinforced concrete chimneys, and Mr. Clark has had the responsibility for specifying and designing many of these chimneys, including a considerable number 400 feet high or taller. He has also authored various articles and papers on chimney design and maintenance.

An interesting note is that three generations of H. Clay Moore's have represented Custodis in the Southeast continuously since 1902, with H. Clay Moore, Jr. now serving as president of the firm.

Mr. Clark, a registered Professional Engineer, is a member of Tau Beta Pi, The American Society of Civil Engineers, and The Society of American Military Engineers.

## Southern News Briefs

(Continued from page 21)

### Medical Supply — S.E.

Appointment of Norman B. Hall as Southeastern regional sales manager is announced by **Medical Supply Company**, Rockford, Illinois, manufacturer of first aid equipment and supplies for industry.



Mr. Hall has headquarters in Atlanta, Georgia. Territory under his supervision includes Mississippi, Tennessee, Alabama, North Carolina, South Carolina, Georgia, and Florida.

In Mr. Hall's previous industrial safety work he has served as assistant safety supervisor for Kaiser Aluminum and Chemical Corp.

### Ft. Worth Steel & Mach'y Honors Georgia Manager

T. K. Pratt of College Park, Ga., was cited recently in Fort Worth, Texas, for 25 years of service with **Fort Worth Steel & Machinery Company**.

Mr. Pratt is the company's district manager in charge of the branch office and warehouse at 1090 Dill Ave., S. W., in Atlanta. He received FWS&M's only 25-year service pin for 1960.

The company manufactures and markets nationally various types of mechanical power-transmission equipment and bulk-materials-handling machinery.

### Parker-Hannifin—Carolinas

Livingston & Haven Inc., 2115 Meeting Street Road, Charleston, S. C., and 1119 East 10th Street, Charlotte 7, N. C., is a newly appointed distributor for **Parker-Hannifin Corporation's** Hydra-ride ac-

cumulators. These shock-absorbing devices for material-handling vehicles are made by the Parker Hydraulics Division, 17325 Euclid Ave., Cleveland, Ohio.

The distributor is an outlet also for Parker industrial tube and hose fittings and Crown air regulators, filters and lubricators. Malcolm D. Haven in Charleston is president, while the Charlotte operation is managed by John E. Moorefield, vice-president.

### J. A. Cain Retires A. M. Byers — Atlanta

James A. Cain, Atlanta Division manager for **A. M. Byers Company**, has retired after almost 18 years of service.

Mr. Cain joined the Byers firm in 1942 and has held the positions of field service engineer, assistant Pittsburgh Division manager, and Atlanta Division manager.



Formerly associated with Pennzoil Company in Atlanta, Mr. Cain is a member of the American Society of Heating and Air Conditioning Engineers, and both the Florida and the Georgia Engineering Societies.

### Hooker Reid Co. — Ga.

**Hooker Reid Company**, P. O. Box 11754, 4271 Garmon Road, Atlanta, Georgia, has been formed as manufacturers' representative for the Southeast. Owner of the company is Jack Reid, a Registered Professional Engineer in Georgia, who has had thirty years' experience in industry and sales.

Lines of equipment for both the mechanical and electrical fields are being handled. Among the companies represented are Master Levels Controls Co., Excel Electric Service, Kerco, Lexington Electric Products, and King Knight Co.

Jack Reid is also associated with J. B. Frescoln of the Dynamatic Division of Eaton Mfg. Co., 716 Walton Bldg., Atlanta, Ga.

### Swartwout Fabricators Acquires April Showers

**Swartwout Fabricators, Inc.**, manufacturer of ventilating and fire relief equipment for industrial buildings, has acquired April Showers, Inc., producer of roof sprinkler cooling systems.

G. V. Patterson, Swartwout president, states that the April Showers cooling system has proven quite successful in preventing solar heat from penetrating through the roof to people and materials below. It can be used by itself or in conjunction with ventilating and air conditioning systems where it materially reduces both initial equipment investments and operating costs.

Acquired from Leonard Holder, inventor of the system and president of the former company, April Showers will operate as a division of Swartwout Fabricators.

### Management Changes at Mogul Products Company

The North American Mogul Products Company, Cleveland, Ohio, has announced the formation of a new executive and management group to maintain and strengthen the company's present position in the water treatment field.

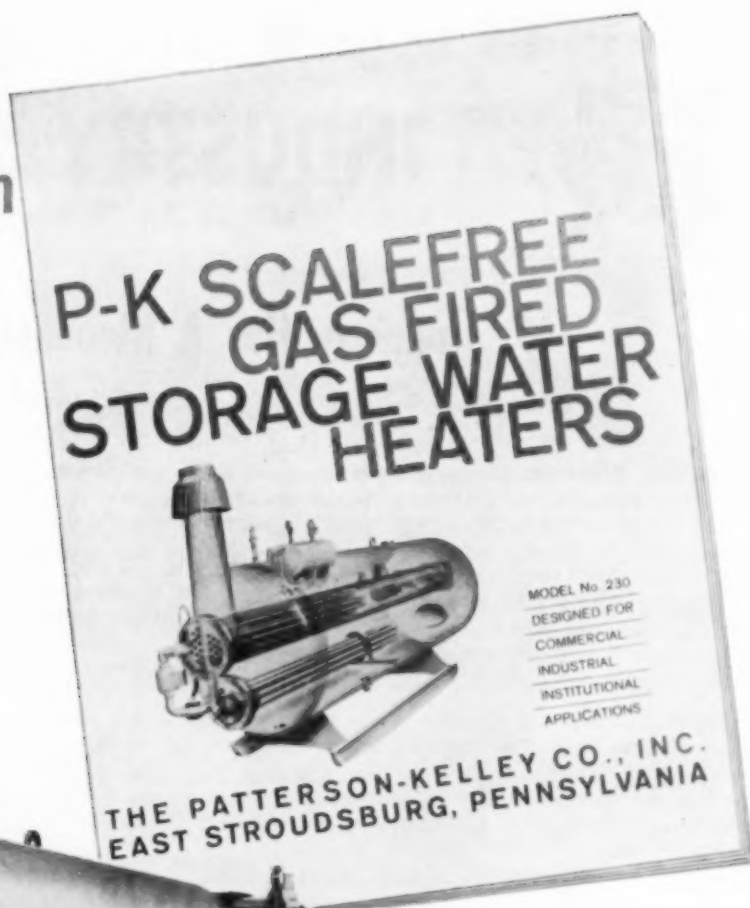
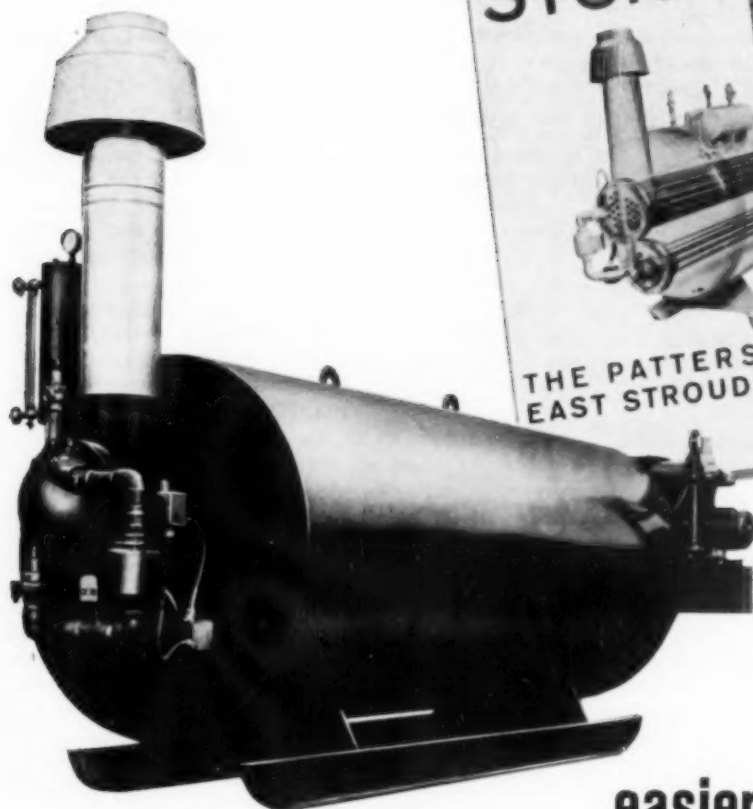
Arthur W. Pugsley, President of the company since 1951, has been named Chairman of the Board. C. Carlisle Tippet, formerly Vice-President and Treasurer, has become the new President and Treasurer of the company.

R. H. Mohrman and E. R. Strunk retain their positions as Executive Vice-President, and Secretary, respectively. William T. Sullivan has been named Vice-President—Sales and Marketing. George P. Loomis, Jr. has been elevated to Vice-President—Customer Service and Development. Stiles B. Twitchell is now Technical Sales Director.

The above is another step in a long-range plan of expansion and diversification for The North American Mogul Products Company. During the last five years, the company has doubled its sales volume. The company was founded in 1915 and is represented nationally.



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for  
bulletin  
no. 4



**easier to maintain**

**easier to install...**

Striking new economies are now available for commercial, industrial and institutional buildings with P-K's SCALEFREE 230, the first indirect gas fired storage water heater • **Installation.** A complete and automatic package, P-K's SCALEFREE 230 can be skidded into place, hooked up and checked out quickly. There is no complicated piping or electrical work to run up costs. No stack is needed for extra draft. No foundation is necessary. Factory insulation (optional, as illustrated) further reduces costs and avoids the complications of on-the-site insulating. • **Maintenance.** P-K's SCALEFREE 230 offers new freedom from trouble. It won't scale—and retains its rated efficiency—because heat transfer occurs below the temperature at which scaling minerals precipitate. Linings of Pre-Krete® or copper keep the storage section free of rust and corrosion regardless of water conditions. • P-K's SCALEFREE 230 is available in storage capacities from 250 to 4,000 gallons; recovery sections from 390,000 to 2,215,000 BTU. Bulletin No. 4 gives complete engineering and performance data. Address your request to: The Patterson Kelley Co., Inc., 62 Morgan Avenue, East Stroudsburg, Pennsylvania.

**Patterson  Kelley**  
Water Heater Division



# INDUSTRY SPEAKS

## Industry Has A Mandate Also

**ROGER M. BLOUGH**, chairman of U. S. Steel, recently declared that "in these critical times when the future of our nation depends so heavily upon the effectiveness of the new administration in Washington, no thoughtful American can fail to wish devoutly for the successful solutions of the problems that the administration will face, nor can he fail to contribute in every possible way to the achievement of those solutions."

Mr. Blough stated that while it was impossible to determine which of the proposals advanced by the new president had the approval or disapproval of the people, one thing was clear; that the new president does have a mandate — the kind of a mandate that every president of the United States thus far has fortunately had — a mandate to keep America strong, to keep it secure, to keep it dynamic and to keep it free!

Observing that many people have been wondering how the policies and actions of the new administration are going to affect the progress and growth of business, Mr. Blough said, "It occurs to me, as it doubtless has to all of you, that a more constructive mental exercise at this season would be to ask ourselves how our business and industrial system can best help to meet the grave responsibilities and the critical problems which this new administration has inherited; for it is clear, I think, that we — in business — have a mandate too; and like every other group in our society, we share with this new administration the obligation to play our full part in keeping America strong, secure, dynamic and free."

Taking America's dwindling gold reserves as one example of the critical problems confronting the nation, he said that "when government has done all that it safely can do to curtail the expenditure of public funds abroad, it will be up to us, I think, to do the balance of the job by increasing our sales of goods and services in competition with foreign producers in the markets of the world."

"So when we ask ourselves how we are going to discharge this mandate of ours," Mr. Blough continued, "— how we are going to play our full part in an all-American effort to meet the grave responsibilities that our nation and our Government must

face in the years immediately ahead — there is, to me, but one answer: we can do this only if we improve our competitive position, and our competitive potential with the greatest possible dispatch."

Discussing ways in which business and industry might do its share, he pointed out that "to increase our sales in markets now held by foreign producers would mean that thousands of persons who are now without jobs could get back on the payroll while the job security of others, now at work, would be enhanced. It would mean new construction and the strengthening of industrial facilities which have always been the backbone of our national defense. It would stimulate new growth in almost every segment of our economy. And it would enlarge the resources of government at all levels without recourse to the deadening effect of increased taxation, or resort to the disastrous consequences of inflation."

Mr. Blough outlined four basic elements which would assist industry in achieving its goals: "First, innovation — the development of new products and services and the consequent creation of new markets. Second, perhaps, is the constant improvement of quality to the end that American products may retain or increase their superiority over competing items made elsewhere. Third, is the reduction of costs and the increase of productivity by every practical means so that American made goods can be offered in world markets at the lowest possible prices consistent with the high standards of American production.

And when all of these things have been accomplished, a fourth — and key — element is more intensive and effective salesmanship, by which I do not mean faster-talking salesmen, but rather the development of new forms of customer appeal and customer service."

Stressing that if America is to be strong, secure, dynamic and free, Mr. Blough cautioned that "it cannot be divided into warring groups and contending factions. It cannot afford to dissipate its great energies on useless and senseless internal strife. There need be no hostility between labor and business or between agriculture and labor or between the producer and the consumer or between any other groups in our society."

# Why Every Steam Heated Unit Needs its Own Steam Trap

... the theory, practice and proof of "unit trapping" for top temperatures

Using an individual trap for each steam heated unit, including each separate coil, chest or chamber of a machine—pays off for the user.

Here are just two examples:

## 1. On a creamery dryer

Drainage Method	Air Temperature
Restricted Blow-thru	250°
Group trapping (1 trap for 8 coils)	225°
<b>Armstrong Unit Trapping (8 traps—1 for each coil)</b>	<b>309°</b>

## 2. On a platen press

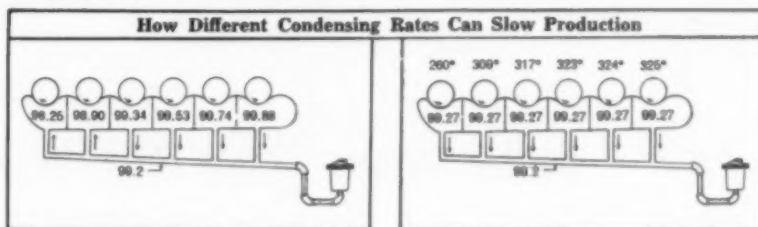
Drainage Method	Processing Time
Restricted Blow-thru	50 minutes
Group Trapping	35 minutes
<b>Armstrong Unit Trapping</b>	<b>25 minutes</b>

## Why Unit Trapping Works Best

It is reasonable to assume that no two steam heated units will have identical condensing rates. Even the slightest difference in rate will cause a difference in steam pressure drops through the units. Here's where the trouble starts. Condensate from each unit may flow to the trap. But, what about air and other non-condensibles in the system? A difference in pressure drops too small to be indicated by an ordinary pressure gauge will permit backflow of steam from the higher pressure units to the lower pressure units. This backflow of steam may even impede flow of condensate from the lower pressure unit to the trap... and it will definitely impede or block off flow of air to the trap. The result is sluggish heating, reduced temperatures, reduced output, fuel waste and increased possibility of corrosion. Figures 1, 2 and 3 diagram the action.

## Unit Trapping Not Costly

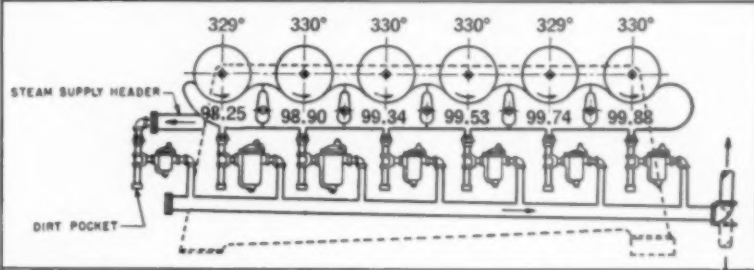
No engineer wants any more me-



**Fig. 1** This is a 6-roll ironer shortly after it has begun operating on 100 psi steam. When cold, wet material passes over chest 1, steam condensing rate is high and pressure drops accordingly. The pressure drop in chest 2 will not be as great, and so on down the machine as the material becomes progressively hotter and drier. Average pressure in the chests then is 99.27 lbs., and drain header pressure is slightly less, about 99.2 lbs. Under these conditions, steam from drain header enters chests 1 and 2 (as indicated by arrows at side of drain lines) because of pressure difference. Though condensate from chests drains by gravity, air can't leave chests countercurrent to incoming steam. Fig. 2 shows what happens next.

**Fig. 2** This is the same 6-roll ironer after it has been operating a while. Air has accumulated in chests 1 and 2, reducing condensing rate and decreasing pressure drop. This process repeats itself down the line until pressures are as shown—that is, enough air will accumulate in each chest so that condensing rates and pressure drops of all chests will be about equal. The net result is shown in chest temperatures which are actual pyrometer readings taken on a 6-roll ironer, drained by a master trap, in a Chicago laundry. The laundry was making 337.9°F steam, but getting an average of only 309.6°F from the ironing surfaces, necessitating slow operation and frequent reruns. Then they tried Armstrong unit trapping—see Fig. 3.

## How Unit Trapping Prevents Trouble



**Fig. 3** This is the same 6-roll ironer, now unit trapped. Temperatures shown are also actual pyrometer readings—the average of 329.6°F is 20° higher than

with group trapping. This is because air is continually removed from each chest into the drain header, and cannot get back into any chest.

chanical devices in his plant than are absolutely necessary. But, the moderate additional cost of using two or more small traps, instead of one big one, is saved over and over again in improved efficiency.

If the traps are Armstrong, maintenance is no problem. And users frequently tell us that Armstrong traps outlast others two and three to one.

Steam traps usually represent a fraction of 1% of the cost of the equipment they drain. Does it make good sense to lose 10% or more of equipment capacity to save a few dollars on traps?

Why not test Armstrong unit

trapping in your plant. If you are not completely satisfied with the results you can return the traps for a full refund of the purchase price. There is little to lose—lots to gain. Call your local Armstrong Factory Representative or Distributor, or write **Armstrong Machine Works, 8067 Maple St., Three Rivers, Mich.**

ASK FOR the 44-page Steam Trap Book and reprint of article on Unit Trapping.

80157



**ARMSTRONG STEAM TRAPS**

# TIMELY COMMENTS



## Better Work, Better Pay, Higher Status

**NOT SO MANY** years ago an "apprentice" was an *ambitious youth* and a "craftsman" was a *highly respected citizen*. That was before the creed of "a chicken for every pot" and "a college degree for every youth" was expounded and sold to the public.

Some uncouth soothsayer, hiding under a stone in a dark corner did come up with the question: "Who's gonna collect the garbage?" But no one took time to answer him. The status seekers and status makers were too busy downgrading sweat of the brow to foresee high unemployment going hand-in-hand with unfilled demand for competent workmen.

Now the cry is on! Where are we going to get the host of skilled service men needed to "keep our pots boiling?" Not from the diploma seekers — they are all in college. Not from the lazy slovens — they can't understand today's highly mechanized equipment.

So we have a lament expressed by E. R. Stroh, vice-president of Electric Autolite Company, speaking before members of the Automotive Electric Association: "A quarter of a million automotive service men are needed right now. One manufacturer alone needs almost 60,000 mechanics for its dealerships."

Baiting the hook — he went on to say, "With the complexity of equipment today, properly trained service men are very near the level of engineers." He pointed to the master mechanic as a prime example of an "unsung but highly responsible and rewarding executive function."

While the leaders in other industries are not yet crying as loud as those in the automotive field — the pinch is being felt nonetheless. And you do not have to go into a big industrial plant to prove the point. Just try to get your refriger-

ator, or your heater, or your roof repaired. You will quickly agree with Mr. Stroh that more good service men and mechanics are needed.

But what can men in industry do about it?

Perhaps as Mr. Stroh faces the problem and says, "These men are needed," he is already on the right road. A feeling that one is needed is one of the greatest builders of personal satisfaction — *status*, if you prefer the modern term.

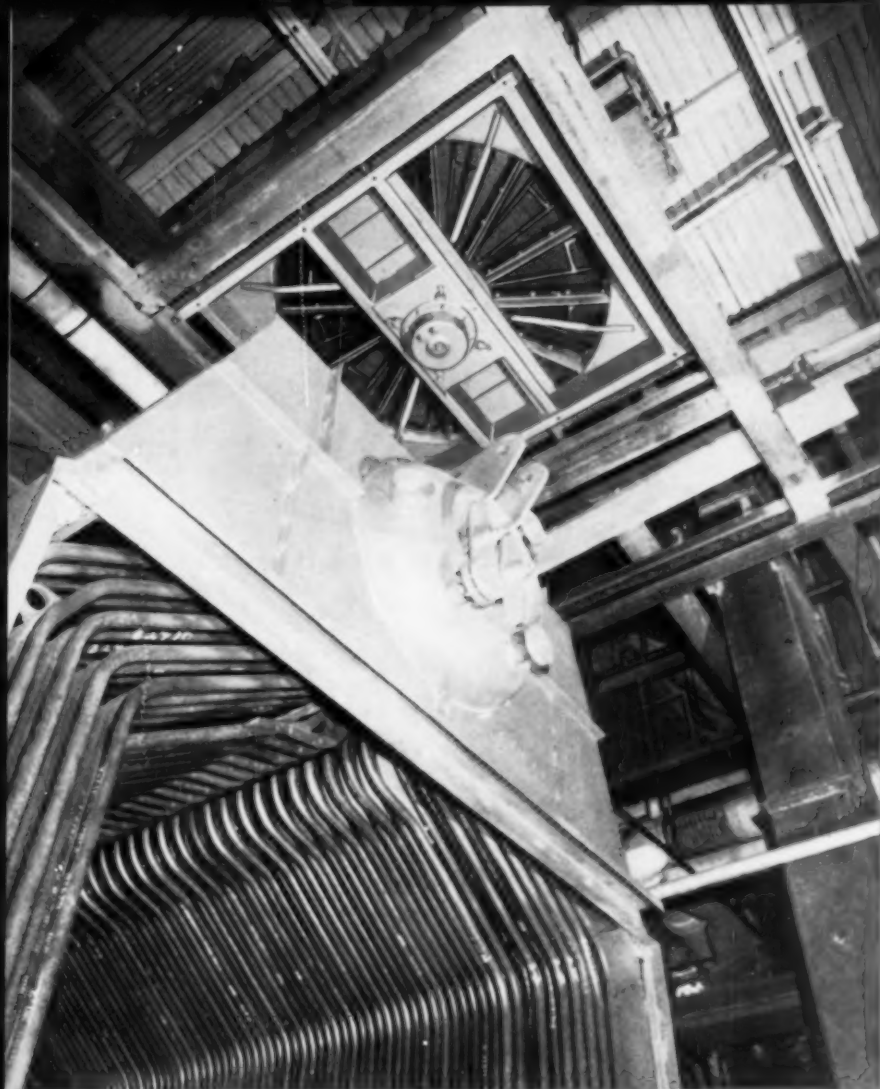
Admitting the need, and willingness to pay for a skillfully executed job can go far toward reestablishing the word "craftsman" and developing pride in mechanical and maintenance skills.

Developing the enormous competent working group that Mr. Stroh says is necessary will not be easy. But the men in industry from top to bottom are the ones that will have to do it. Through consideration of the points covered by Dean A. Ray Sims in his article *Technical Institute Education* (P. 42, Jan. '61 SPI) will do much to aid basic thinking on this important subject.

Employers will have to look more generously on skills and accomplishments and place a little less emphasis on diplomas in their hiring programs. And labor leaders, in building the financial and personal standing of their members, need to be ever conscious of the fact that only capable men deserve high pay. Therefore one of the best ways to raise average pay is to raise average ability.

The day may be just around the corner when business leaders and labor leaders will be working more cheerfully together to develop better training programs. Industry wants *good men* and labor wants *good pay*. Fortunately the two points of view are not at all incompatible.





*The Ljungstrom Air Preheater at the B. F. Goodrich Company Shelton Plant is installed directly over the 65,000 lb/hr Wickes boiler. Flue gas leaving the boiler at 615°F passes through the circular rotor, which absorbs the heat and releases it into the incoming air. Preheated combustion air improves combustion, makes fuel burn cleanly. This Package Air Preheater was factory-assembled, and required only 100 manhours to install.*

*At B. F. Goodrich Co.'s Shelton Plant*

## Air Preheater boosts combustion air temperature 345°F... gives 6% more thermal efficiency

"Only a Ljungstrom® Air Preheater, with its continuous regenerative principle, could meet our requirements", says A. G. Sandomirsky, Manager of Engineering at the B. F. Goodrich Company, Shelton, Conn., plant. "We produce foam rubber 24 hours a day,

five and six days a week. With an Air Preheater we can meet process steam requirements more economically, and an Air Preheater helped us to justify the installation of high efficiency, high pressure equipment for by-product power generation."

Here's why the Shelton plant meets its requirements best with a Ljungstrom Air Preheater:

1. Ljungstrom is the most efficient heat exchanger you can buy. The Ljungstrom rotor revolves continuously through the flue gas and incoming air, thus absorbing heat and releasing it *from the same surface*. Since the heat doesn't have to pass through anything, each inch of rotor surface is as efficient as one foot of a tubular recuperator.

2. Ljungstrom is the most reliable heat exchanger you can buy. All heat exchange elements pass through the entire air and gas streams. The temperature of the elements in the coolest region — where fresh air enters — is actually an average of the gas and air temperatures, so it's consistently higher than the coolest point in a recuperative heat exchanger. Result: no cold spots, less chance of moisture formation.

3. Ljungstrom is easiest to maintain. You can inspect it — and clean it — while it's running. Heat exchange elements are divided into modular baskets that can be replaced individually without disturbing the other elements. You can even reverse the elements if the surface has thinned on one edge, effectively doubling the life of the heat exchange surface.

For more information on the Ljungstrom continuous regenerative principle, or on the Air Preheater that meets your requirements, phone MURRAY HILL 2-8250 or write to The Air Preheater Corporation.

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(manufacturing, process, utility and service).

## *A Plant Installation Report*

# **ELECTRICAL SERVICES**



*How Power Is Supplied for Texas Instruments Incorporated — Dallas, Texas*

# **Electrical Distribution for Large Plant**

By **ROBERT S. SLOAN**, Director of Facilities, Texas Instruments Incorporated  
**J. F. SCHWEGMANN**, Winston & Schwegmann (Consultants) Dallas, Texas  
**W. A. HIERS**, President, Hiers Engineering Co. (Consultants) Dallas, Texas  
**ROB ROY**, Rob Roy Electrical Company, Installing Contractors, Dallas, Texas

**THE PRODUCTIVE ABILITY** of an industrial plant is only as good as its electric power distribution system. When the power supply is unreliable or fails, all production suffers or stops. The best distribution system for such a plant is one that will most economically and safely distribute power adequately to the load devices, and allow for expansion of the system for future probable loads.

In practically all plants, processes change and equipment is purchased from time to time so that loads are connected or transferred from one circuit to another. Sooner or later an overload condition occurs. Stop-gap emergency measures taken to keep production rolling may cause circuit breakers and switches to be patched or oversized, heedless of the fact that conductors are overheating and insulation is deteriorating. Under such conditions a short-circuit develops and the factory is shut down.

**THE NEW 350-ACRE** Texas Instruments Incorporated site in Northeast Dallas, when fully developed, will represent one of the nation's major electronic industrial and technological complexes. First work on the site started in 1957 and by early 1960 six buildings were completed and occupied. The

engineers plan of the plant site, Fig. 1, shows that a total of 15 buildings are contemplated for this site.

Electricity is used for all manufacturing processes, light and general power, and partial air conditioning. Steam is used for all other air conditioning and for heating. A

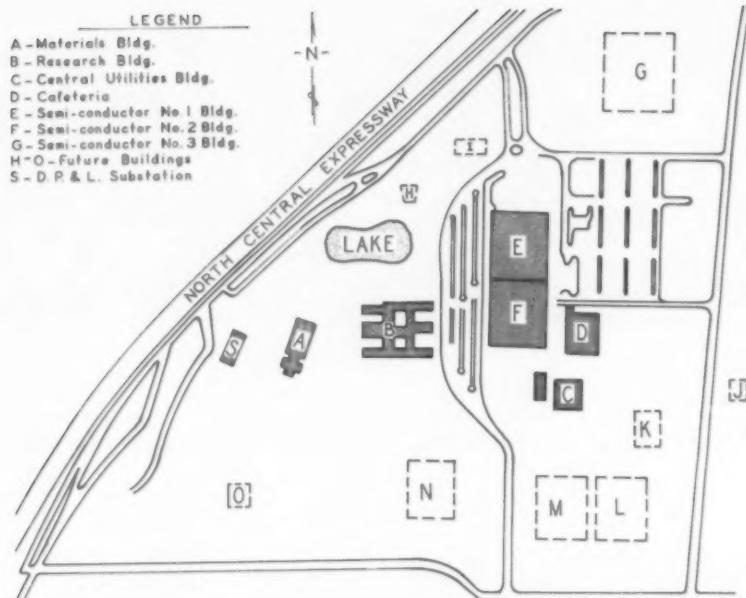
Central Utilities Building is the distribution point for both electricity and steam.

### **Design Considerations**

Basically, the problems confronting the engineers in developing a distribution system for this plant are set forth in Table 1.

### **System Pattern**

A loop primary high voltage arrangement, with a secondary selective system using network protectors was considered the most ideal arrangement for this application. However, it was not initially known how the plant expansion would progress. Unless expansion is rapid, such a system incurs the disadvantage of a large initial investment that would not be fully used for some time. Therefore, certain concessions were made to cost. A primary selective radial system, Fig. 2, was developed for the distribution of power within



Plant Site and Building Arrangement — Texas Instruments Incorporated, Dallas, Texas. The Shaded Areas Are Completed.

Texas Instruments has other manufacturing plants in Dallas, Houston, Attleboro, Mass., Versailles, Ky., and in seven countries overseas, including a major plant at Bedford, England. Total company sales in 1959 totalled \$193,000,000. President P. E. Haggerty estimated 1960 sales of between \$240,000,000 and \$250,000,000.

It began in 1930 as a geophysical exploration company, contracting its services to oil companies for prospecting in all parts of the world. This remains an important part of its business. It now supplies complex electronic and electro-mechanical systems for defense and civil agencies of the government, is the world's leading producer of transistors and other semiconductor devices, and manufactures instruments and systems for the petroleum and other industries. It also is a foremost manufacturer of thermostatic and electrical controls, clad metal products, and nuclear fuel components, elements and cores.

the plant site, with initial capacity of 12,000 kva.

The main power source is from the Dallas Power & Light Company distribution substation located adjacent to the plant site. This substation is supplied by two separate 138,000 volt overhead transmission lines into separate 12,000 kva, triple rated, power transformers, and stepped down to 13,800 volts, wye. Each transformer is furnished with sufficient reactance in the neutral to limit ground fault current to phase fault current level.

The incoming power is received into the plant site at the Central

Utilities Building over two 3-phase, 1000 mcm underground circuits, each with a maximum continuous power capacity of 12,100 kw. This capacity may be expanded to a total of 20,000 kw by the addition of three 1000 mcm cables to each power source in the original duct bank.

The loading schedule within the individual load areas is so arranged that when a fault or outage occurs on one of the primary sources, only one-half of the load in any area is dropped. By individual transfer schemes within the load areas, total power service can then be restored within minutes.

The primary power voltage is carried as close to the load centers within the buildings as possible, where it is then transformed down to the utilization voltages.

### Voltage Levels

The load density and the system pattern had a very pronounced effect on the selection of voltages. At 13,800 volts, the primary selective radial system can be employed to build up load areas for a total magnitude of 35,000 kva. This voltage is a standard distribution level, facilitating the use of standard equipment and underground cables. A comparable system at a lower voltage level would not only have a cost that would be prohibitive, but would tax the ability of the equipment.

The load to be served within such a small area, approximately 2/10 square mile, required cables of such size to overcome thermal limitations that voltage regulation presented no problem.

### Cables

Solid type-impregnated paper insulated-lead covered cable with plastic jacket was selected over its comparable rubber insulated type for the following reasons:

- (1) Ground contour of the site was comparatively level.
- (2) Ground conditions are dry; moisture is only present during a short wet season, and the system will be kept dry by proper drainage.
- (3) System is classified as a combined sub-transmission and distribution system with a minimum of splices and joints.
- (4) Has greater power loading capacity.
- (5) Costs are approximately 2% less.

The loading capacity of the various cables within the system are influenced by the duct bank arrangement, and the number of loaded cables within each bank. Figure 3 shows the arrangement finally developed as the most desirable for the main distribution cables to the various load areas. The individual load capacities of the cables are listed in Table 2.

Day by day, and month by month loading of the distribution system is being observed by charts



Fig. 2—Single Line Diagram—  
Initial Distribution System.

and schedules, so that overloading of circuits can be anticipated and avoided by planning ahead. Charts have also been prepared of expected summer and winter loads to enable requirements to be determined at least 6 months ahead of when they occur.

In order to stay within the recommended safe design limits of 25 volts on the cable covering, the metallic sheaths of the cables were bonded to ground at one point of each cable section. Cable sheath lengths were confined to a maximum of 400 feet by designing the duct bank and manhole system to conform to this requirement.

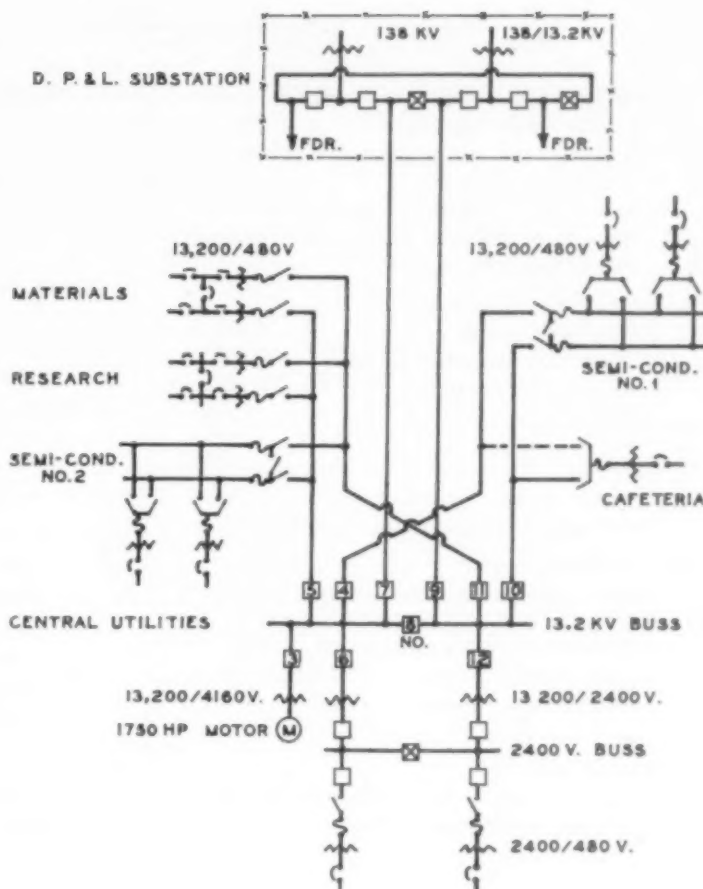
Lead splices bonded to ground are inserted into the sheath in all odd numbered manholes. Insulating splices are inserted into the sheath in all even numbered manholes and allowed to float above ground potential. Grounding of termination points within buildings also followed this scheme. An indication of the success obtained by this method is illustrated in Table 3.

### Cable Duct System

The underground duct banks were designed to be consistent with system economics, keeping costs to a minimum, but preserving quality. Among factors given consideration were:

1. Low installation costs.
2. Low friction coefficient to lessen cable pulling strain.
3. Good heat dissipation.
4. High strength qualities to withstand mechanical stress at a minimum depth of 30" below pavement, roadways, etc.
5. Does not have properties deleterious to the cable covering.
6. Is of non-magnetic material.
7. Has minimum electrical losses.

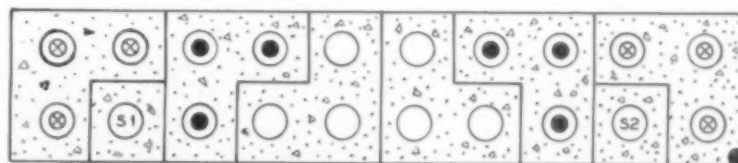
Fig. 3—15 Kv Underground  
Cable Duct Configuration.



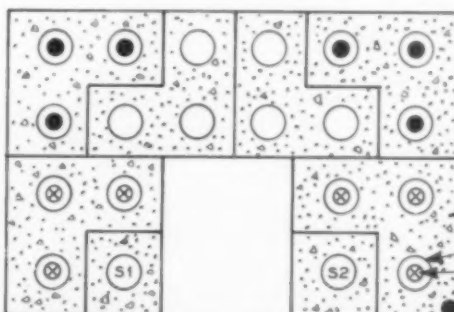
Careful observance of these and other installation design details greatly contributed to a major reduction in the cost of installation of the cable, the operational reliability, and the service continuity

of the cables.

The type of duct bank construction used throughout the system is illustrated in Fig. 3. This flattened configuration offered the least thermal resistance, with minimum



CABLE DUCT CONFIGURATION BETWEEN MANHOLES



CABLE DUCT CONFIGURATION AT MANHOLES

TABLE 1 — Basic Elements of Electrical System Design

1. The system must have a high degree of reliability, consistent with overall system economics:
  - a. It must use high quality equipment with a very low failure rate.
  - b. It must have an alternate source of power to assure service continuity, and facilitate equipment removal and maintenance.
2. The System Power Requirements are:
 

a. Initial peak demand .....	12,000 kw
b. Intermediate peak demand .....	20,000 kw
c. Ultimate peak demand .....	35,000 kw
3. System Load Factor .....
4. System Power Factor .....
5. System Supply Voltage:  
13,800 volts, 3 phase, grounded neutral, wye
6. System Application:
  - a. All distribution must be underground.
  - b. All cables must be in non-magnetic duct.
  - c. All cable lays 30" minimum depth.
  - d. Earth Thermal Resistivity ... 100 ohms/cm<sup>2</sup>
  - e. Earth Ambient Temperature ... 30 C
  - f. Earth Condition .....
7. Utilization Voltages:
  - a. Main electrical air conditioning power is supplied at 4,160 volts, 3 phase, 4 wire.
  - b. Utility services are supplied at 2400 volts, 3 phase, 3 wire.
  - c. Interplant distribution for manufacturing, power and lighting is: 480/277 volts, 3 phase, 4 wire and 120/208 volts, single phase and 3 phase, 4 wire.
8. System Power Continuity: The service continuity of the system must be consistent with good design and within the limits of the available power sources.
  - a. Utility power company power sources have 20 cycle reclosing on the 138 kv level; none on the 13,800 volt level.
  - b. Power transfer of the primary sources at the utility company substation is one minute.
  - c. Power transfer of the primary sources at the central utilities building is automatic and one minute after loss of voltage.
  - d. Power transfer of primary sources at the load areas in the buildings is manual.
  - e. Power transfer of secondary power within the load areas in the buildings is manual.
9. System must be adequate to serve the present capacity requirements, and provide flexibility to allow the system to be expanded or changed to meet future load requirements.

losses, adapting itself to the right-of-way requirements, at the best possible minimum cost. Normal rectangular configuration was maintained at the manholes only to keep their design within economical limits. Transposition was made approximately 20 feet out from the manholes.

The design of the manholes was determined by conditions and location. In the interest of economy, but still maintaining good design practices, a standard was developed using three basic designs; 4-way, corner, and straight. Ample space was allowed for cable racking, splicing, drainage, and other

working conditions. Space was not allowed in the manholes for any system switching equipment.

#### Switching Equipment

High quality switching equipment, with a low failure rate, all consistent with system economics, was installed. Wherever switching requirements were of any magnitude, metal clad switchgear, with its necessary complement of protective relays, was installed. Wherever switching requirements were considered low, with no automatic switching, high voltage metal enclosed fused disconnecting switches were installed.

Circuit breaker switching was employed at the Dallas Power & Light Company distribution substation and the main distribution

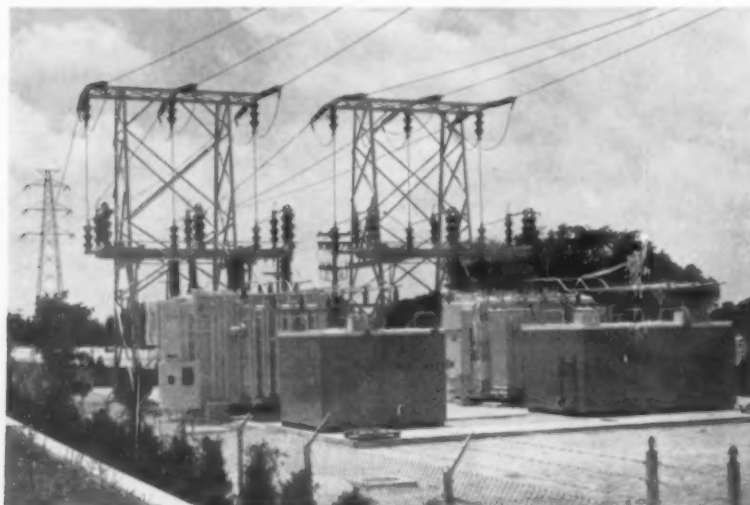


Fig. 4—Utility Company Primary Substation, 138 kv down to 13.8 kv.

location in the Central Utilities Building. High voltage switches and fuses were installed at the entrance to each main load area, and each local load area power center unit.

#### Circuit Protection

Fault and overcurrent protection of the distribution system is provided by a combination of properly coordinated induction type overcurrent relays and fuses for the 13,800 volt level, and magnetic thermal overcurrent circuit breakers for the 480 volt level. Coordination and protection of the 120/208 volt level was handled on a local basis.

In the development of the coordination study, primary consideration was given to protection of the system under fault conditions, with overloading being a secondary consideration.

This primary selective radial system is normally operated with the two power sources energized and feeding power to the distribution system, but are separated electrically by interlocking. A maximum fault condition of 6100 amperes rms is available at the Central Utilities Building bus from each power source. Ground fault current is limited to phase fault current level.

The metal clad switchgear at the Central Utilities Building has an interrupting ability of 250,000 kva, or 11,100 amperes rms at system voltage. Switchgear rated at 150,000 kva would have been satisfactory under initial conditions; however, the higher rated switchgear allows a margin of safety for connecting the two power sources together during emergency switching operations, and also for future increase in source transformer capacity when expansion develops.

The phase relays of the incoming power sources at the Central Utilities Building are set to operate below the time current curve

TABLE 2 — Ampere Capacity of Cables

Conductor Size	Circuit No.	12 Loaded Cables		18 Loaded Cables	
		75% LF	100% LF	75% LF	100% LF
1000 MCM	7 & 9	555	491	474	407
1000 MCM	Future	—	—	427	363
500 MCM	5 & 11	378	329	345	297
1/0	10 & 4	216	193	—	—

TABLE 3 — Cable Sheath Voltage per 1,000 Ft.

Circuit No.	Ampere Load	Phase	Voltage at 75% LF
7 & 9	474	A	51 Volts
		B	45 Volts
		C	51 Volts
Future	427	A	39 Volts
		B	41 Volts
		C	66 Volts
5 & 11	345	A	40 Volts
		B	37 Volts
		C	35 Volts
10 & 4	216	A	13 Volts
		B	12 Volts
		C	18 Volts

of the relays at the Utility Company substation. All other relays on feeder circuit breakers are set to coordinate with these main source relays.

Radial feeder relays coordinate with the primary distribution fuses at each load area. These in turn coordinate with the individual

load area power center transformer units. Likewise, the individual high voltage power fuses on the power center transformer units are set to coordinate with their respective low voltage, 480 volt, thermal magnetic overcurrent circuit breakers.

By this calculated coordination



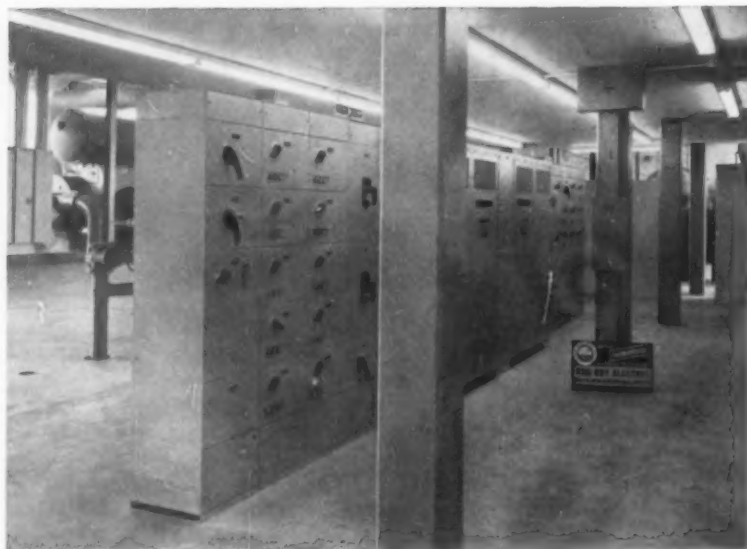
Fig. 5—13.8 Kv Primary Distribution Switchgear in Utilities Bldg.



Fig. 6—2400 Volt Distribution Switchgear in Utilities Bldg.

Fig. 7—480 Volt Distribution Switchgear in Utilities Bldg.

Fig. 8—480 Volt Cooling Tower Switchgear.



of the system protective devices, protection of the primary distribution system is achieved, assuring system continuity, and confining system faults to the area in which they originate.

### Grounding

Low impedance grounding of the distribution system was accomplished by installing a 500 mcm bare copper conductor in parallel with the main power conductors throughout the system. The bare conductor was firmly imbedded in the duct bank concrete envelope, and is connected to all primary and secondary switching equipment, ground busses, power transformers, and the underground grid at the Central Utilities Building location.

### Installation

The trend toward the transmission of bulk power over closely coupled underground distribution systems for industrial plants has not only increased the responsibility of the designing engineer, but has required the installing electrical contractor to have a thorough background of knowledge and experience on such projects.

This plant system has the combined characteristics of a bulk loading transmission system and a distribution system, resulting in many installation complications and techniques. Cable runs were long (up to 3,000 feet), and the cable sizes (1000 mcm and 500 mcm) were large and heavy.

The combined design of the duct system and the location of the manholes greatly facilitated the manner in which the cables were handled. However, the excavation



Fig. 9—View of manhole cable density prior to final racking.

Fig. 10—Technique employed in pulling cable into manhole.

and duct installation, the large amount of cable, its weight and size, equipment, installation and withdrawal techniques, method of arranging, supporting and protecting the cables and duct, all were a part of the field techniques and handling of equipment that fell entirely upon the Electrical Contractor's ability and experience.

All conduit was concrete enclosed with suitable wall thickness to meet soil conditions. The monolithic method of construction was employed as the best for the application and at the least cost. All ducts were assembled in place with wire and spacers, and the duct bank was then concreted as a unit.

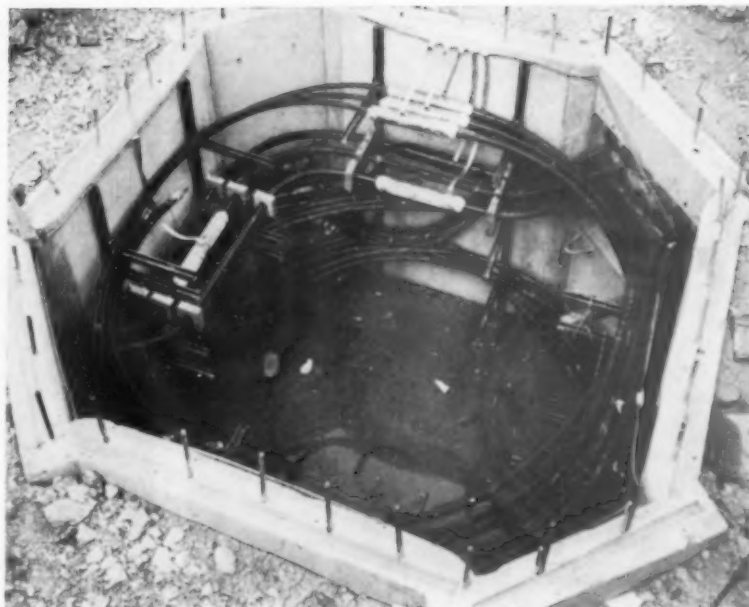
#### Manholes

Location of manholes was determined by drainage requirements, spacing for cable pulls, and sheath voltages. After the locations were established the ground conditions were determined for suitability. Cable pulling eyes were installed in each manhole to facilitate cable installation.

#### Pulling Tension

The problem of pulling tensions on the cables was studied and calculations developed. The recommendations established by IPCEA were followed, together with the recommendations of the manufacturer, which coincided. Maximum pulling tensions and strains adhered to for the various cable sizes were: Total tension did not exceed 5,000 pounds for 1,000 mcm cable, or 4,000 pounds for 500 mcm.

By formula these values were derived so that total tension did not exceed  $0.008 \times \text{number of conductors} \times \text{circular mill area of the cable}$ , or 5000#, whichever is less.



The rule that maximum strain at a bend shall not exceed 100 times the radius of curvature of the duct expressed in feet was also followed.

All cable pulls were made uphill in order to retain full control of the cable and reels.

#### System Expansion

As the plant expansion continues, and new buildings are added to the site, the capacity and facili-

ties of the underground system must be extended accordingly. An expansion of the original distribution system can be developed by:

1. Using a continuation of the primary selective radial principle, reinforced by additional separate power sources from the utility substation; or
2. By a combination of the original primary selective radial system and the addition of a loop sys-



Fig. 11 Left—Four-way manhole and underground duct construction showing transposition of ducts from rectangular to flat configuration and monolithic method of pouring the concrete envelope.

Fig. 12 Right—Monolithic duct construction with flat configuration.

tem to form an overall distribution system.

Either system utilizes the existing facilities to a maximum without incurring unnecessary high adjustment costs. It is, therefore, felt that the engineers are in an excellent position to analyze future growth for this system without in-

curred unnecessary problems. A cost analysis was made of the two types of systems and it is interesting to note that their overall costs are the same.

#### Continuing Analysis

The continuation of the system analysis was developed to deter-

mine which would give the best service continuity and also allow the existing facilities to expand as the plant site expands without tying up investment capital unnecessarily. The loop system lends itself very well if expansion is going to be made by the addition of large bulk power loads in specific areas. Otherwise, the radial system seems best.

Of course, the answer is continual observance of plant growth, and analysis of the load situation from time to time.

#### Principal Electrical Equipment

##### STATION SERVICE SWITCHGEAR—

- 13.8 kv—General Electric Co., metalclad with type AM-250 and 500 breakers
- 4.16 kv—General Electric Co., metal enclosed Limit-Amp controller
- 2.4 kv—General Electric Co., metalclad with type AM-75 breakers
- 480 volt—General Electric Co., type AKD switchgear
- General Electric Co., type CR control centers

##### STATION SERVICE TRANSFORMERS—

- Two—General Electric Co., 3 phase, 2500 kva, 13,200/2400 volt, type AA transformers

- Two—General Electric Co., 3 phase, 300 kva, 2400/480 volt, type AA transformers

- One—General Electric Co., 3 phase, 1500 kva, 13,200/4160 volt, type AA transformer

- One—General Electric Co., 3 phase, 750 kva, 2400/480 volt, type OA/FA transformer

##### 15 KV POWER SWITCHES—

- Nine—S/C Electric Co. load interrupter switches, 15 kv, 3 pole, with type SM power fuses, in outdoor metalclad housing

- Two—Westinghouse Electric Corp. load interrupter switches, 15 kv, with type BA power fuses, in outdoor metalclad housing

##### POWER CABLES—

- John A. Roebling's Sons Corp., 15 kv solid type — impregnated paper insulated-lead covered cable

#### EXTRA COPIES

of this article have been prepared as a service to readers that need them.

#### WRITE THE EDITORS

Southern Power & Industry  
806 Peachtree St., N.E.  
Atlanta 8, Georgia

# MANAGEMENT CLINIC

Conducted by ROBERT H. EMERICK, North Charleston, S. C.



## How To Protect Manufacturing Secrets

### Question . . . . .

**ONE OF OUR TECHNICAL** employees is leaving us to join a rival company. This man is familiar with our manufacturing processes and, in fact, originated some of them.

Now we are worried that he might carry some of this information to his new employer and thereby impair our present favorable position in the field. Is there any way that a company can protect itself against such piracy of secret data?

### Suggestions . . . . .

**ALTHOUGH SOME FIRMS** have felt the need to make court cases of this sort of problem, we believe the dangers to the ex-employer are generally nominal for these reasons:

1. Any company that expects to remain in business must pursue an endless program of design and production improvement. Therefore, what a leaving employee takes to his new job is information up to that moment, and developments subsequent to his departure can make that information obsolete overnight.
2. Patent protection is available. Most companies have no desire to risk patent infringement, because the results of a lost case can include the assessment of high damages and substantial royalties. Information carried by a new employee, consequently, is likely to be treated with caution.

The Clinic suggests that every company whose operations include a secret process or procedure, should obtain signed contracts from all employees having access to or knowledge of these matters, in which the latter agrees to maintain appropriate secrecy not only during employment, but for a period of at least two years after leaving that employment. This kind of contract can be the basis for court action, and a new employer who makes use of such information may find himself a co-defendant in a suit. It has happened this way.

The Clinic also suggests that a company, on the hiring side, discuss with the new employee what limitations on the use or divulgence of confidential information have been placed on him by his previous employer. This is simple prudence, aimed at avoiding later legal or ethical involvements.

And finally, every leaving employee should be accorded a severance interview during which he is reminded of his responsibilities toward the employer he is quitting. Processes and procedures to be considered as confidential are reidentified at this time, just to be sure that a clear understanding exists.

A survey conducted by the Engineers Joint Council indicates that less than half of the employers queried are presently protecting themselves with contracts and interviews. In our opinion, this is negligent.

# Spring Clean-Up for Cooling Towers

## Helps Maintain Performance and Reduces Maintenance



By **S. L. TERRY**

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Southwestern Public Service Company  
Amarillo, Texas

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Assistant Manager (Service)  
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Tune-up procedures maintain performance at high level and prevent premature failure of equipment.

**REGULAR ATTENTION** (rather than periodic overhaul) is necessary if cooling towers are to maintain high performance. Furthermore, a watchful eye and prompt attention to repair and adjustment needs help keep overall maintenance costs in line with normal wear and deterioration rates.

Just to get the discussion under way, we can define "tune-up" as adjusting, cleaning, and replacing minor parts. There are two types of "tune-up" procedures. One type deals with preventive maintenance, and the second deals with procedures which restore equipment to

approximately the initial tower design performance.

A sound, practical approach to cooling tower "tune-up" is the preparation of a check list which serves as a guide to annual or semi-annual inspection, minor maintenance, and comparative testing. The points covered vary with the type of tower, the service which it performs, and the value placed on tower performance for the industry in which it is operating.

We are presenting an outline for such a chart which is generally applicable to industrial towers operating on the mechanical draft and

splash decking principle. After a thorough inspection and the completion of repairs or adjustments, an informal comparative test can be conducted.

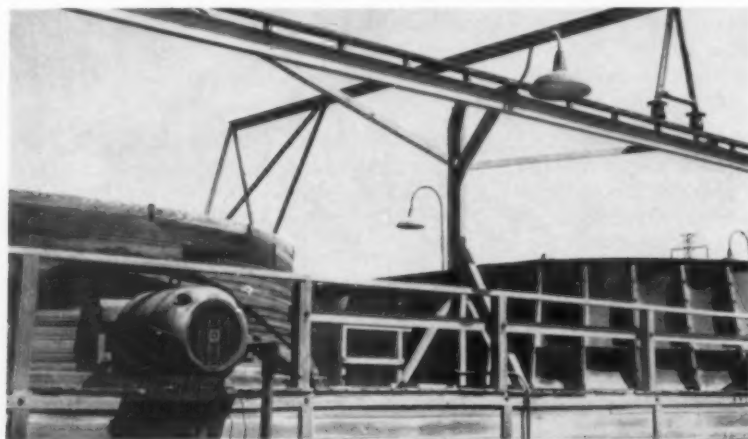
The check list is used as a guide during the spring inspection which takes place after winter icing has passed and before the summer peak loads come on. The inspection should cover all tower components and the inspection record should be made a part of the permanent file for the tower.

Following the inspection comes the "tune-up" plus any major maintenance. After this has been done, the calculation of the approximate performance can be made and compared with the previous data. This should also be made a part of the permanent file for future comparisons.

### Factors of Performance

If a cooling tower is to be maintained at its best performance, it is important that we understand the factors that effect performance and in general how each factor contributes to the tower operation. For purposes of tuning up an existing tower, it is permissible to treat thermodynamics and  $\frac{KaV}{L}$  values very lightly and go directly to copper nail and redwood considerations.

A cooling tower functions to remove heat from a quantity of water. Heat removal is facilitated



Movable lifting beam—an aid to motor, fan and gear box maintenance.



by spreading the water into a thin film and/or breaking it into small droplets to increase the surface of the water in contact with air. The air is passed over this surface and around the droplets, causing partial evaporation of the water from the film or from the droplets, thus cooling the water.

Industrial towers are most commonly of the mechanical draft type and use splash decking to break the water into drops and to spread it into thin films. The decking or fill is designed to give optimum water breakup and wetted surface per cubic foot of tower volume.

The rate at which heat is removed from a given cubic foot of tower volume is governed by two classes of variables. First: the temperature, density, and moisture content of the inlet air; and by the shape and spacing of the fill or decking. These factors are either not controllable or were fixed when the tower was designed. The second class of variables includes those which the operator can ad-

just or vary to some degree and are therefore of interest to us in this discussion.

The controllable variables consist of the following:

1. The amount of water going over the tower
2. The amount of air going through the tower
3. The distribution of water. Each square foot of the fill area should receive the same flow of water, and the same uniform distribution should be maintained at all levels as the water comes down through the tower.
4. The distribution of air passing through the tower. Here again, each square foot of cross-sectional area in the air path should receive the same air flow.
5. The ratio of water to air flow.
6. The splashing action, which should give good water breakup.

The spring "tune-up" will therefore deal with the amounts, the distribution, and the ratio of the water and air passing in contact in the tower. Special attention

should be given to the splash pattern to get good water breakup. Other, equally important, "tune-up" items come under the classification of minor maintenance which may be necessary to minimize the problems of excessive water splashing or blowing out of the tower due to displaced or deteriorated tower components. Still other adjustments and repairs are usually classified as preventive maintenance.

Since many of the items affect performance, dependability, and operating costs alike, it is convenient to put them all together and call the job "Cooling Tower Tune-Up."

For convenience in outlining a type of check list and inspection record, we divide the tower components into an "air side" group, a "water side" group, and a "structure" group.

Starting with the air side, let us consider each item and determine where the trouble spots are found and how to deal with each of them:

## ----- COOLING TOWER "TUNE-UP" CHECK LIST -----

### AIR SIDE

#### A. MOTORS:

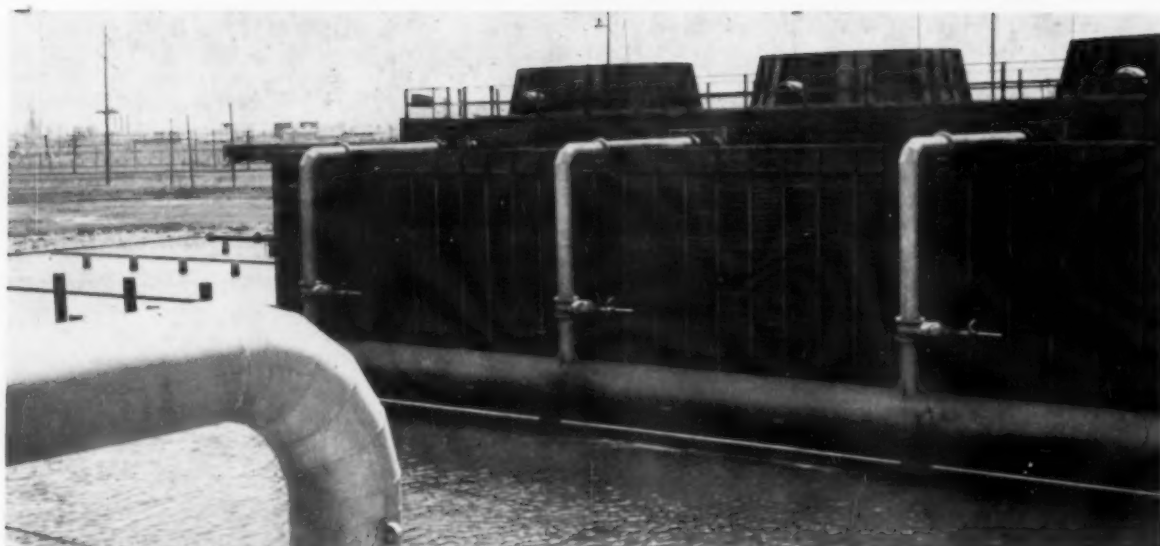
1. Name plate data: Mfr. \_\_\_\_\_, Hp \_\_\_\_\_, Rpm \_\_\_\_\_, Phase \_\_\_\_\_, Cycle \_\_\_\_\_, Volts \_\_\_\_\_, Amp \_\_\_\_\_, Frame \_\_\_\_\_, Type \_\_\_\_\_, NEMA Design \_\_\_\_\_
2. Operating volts \_\_\_\_\_, amperage \_\_\_\_\_
3. Megger readings \_\_\_\_\_
4. Corrosion. If corrosion exists, clean and apply protective coating or replace badly corroded bolts.
  - a. Motor casing and end bell exterior \_\_\_\_\_
  - b. Motor casing bolts \_\_\_\_\_
  - c. Motor anchor bolts \_\_\_\_\_
5. Feel for excessive heating of motor casing or bearing housings. Check for excessive amperage, in the event of casing heating, or blocking of air passage in the motor case. Check and lubricate the bearings, using a lubricant recommended by the motor manufacturer. Be sure grease relief vents are not clogged.
6. Check the condition of the motor shaft and water slinger if shaft extension is equipped with a slinger. Clean off any corrosion. A coating of white lead and oil, mixed to a light paste consistency will protect the motor shaft extension.
7. Check for any clogging of motor drains. Clean as required.

#### B. MOTOR STARTERS AND CONDUIT:

1. Check for any loose connections or indication of grounding in the conduit if megger data indicates trouble. Correct as required.
2. Inspect exposed conduit for corrosion. Clean and coat as required.
3. Check conduit boxes for any indication of moisture in the lines. Drain and trace possible source of moisture. Correct as required.
4. Comments: \_\_\_\_\_

#### C. SPEED REDUCTION UNITS:

1. Are any of the exterior portions showing excessive corrosion? \_\_\_\_\_  
Clean and apply protective coating if necessary.
2. Are any of the anchor bolts weakened by corrosion? \_\_\_\_\_  
Replace as required.
3. Drain lubricant from speed reduction unit. Note condition of oil for any sludging, water contamination, or severe discoloration. \_\_\_\_\_
4. If speed reduction unit is equipped with inspection port, remove inspection port cover and inspect the gears. Note gear tooth contact pattern (Uniform central, uniform toward pinion toe end, uniform toward pinion heel, irregular, or other) \_\_\_\_\_
5. Inspect gear teeth for spalling, galling, indication of excessive local heating, etc. \_\_\_\_\_



Steel components in moist air require periodic corrosion protection.

6. When speed reducer is opened for any purpose, inspect gears thoroughly for conditions mentioned in 4 & 5 above
7. Check for excessive pinion shaft end or side and excessive bearing wear
8. Check fan shaft for excessive end or side play and excessive bearing wear
9. Be sure speed reducer case vent is open.
10. Flush speed reduction unit with a flushing compound recommended by oil supplier.
11. Refill speed reducer with a lubricant recommended by manufacturer. Gallons required
12. Comments:

#### D. SPEED REDUCER SUPPORTS:

1. If supports are steel, is steel rusted?  
If so, clean and apply protective coating. Type of coating
2. What protective coating was original?
3. If these supports are wood members, are the members soft and decayed around bolts or other steel or castings? If so, replace wood as required. Insulate between wood and iron where possible.
4. Are anchoring bolts tight?
5. Any evidence of corrosion of anchor bolts?  
If so, replace bolts if necessary.
6. Comments:

#### E. DRIVESHAFTS AND COUPLINGS:

1. Is there corrosion on the driveshaft?  
If so, clean metal and apply protective coating.
2. Is there evidence of weakening of the floating portion of the shaft?  
If so, replace.
3. Driveshaft material
4. Are coupling parts corroded?  
If so, clean as required or replace.
5. Is there any misalignment of driveshaft coupling at motor or speed reducer end?

If so, correct to manufacturer's tolerance.

6. With mechanical equipment operating at full speed, check for vibration at driveshaft frequency. If vibrometer is available, record vibrometer reading at the motor  
on steel mechanical equipment support  
on fan deck above transverse and longitudinal centerline members near fan cylinders  
If vibration is excessive, balance driveshaft as recommended by manufacturer's instruction manuals.
7. Comments:

#### F. FANS:

1. Any evidence of electrolytic action between iron hubs and aluminum blades?  
If so, clean affected area and apply insulating coating to blade shanks or hub socket. (No-Ox-Id, or an Epoxy coated glass cloth wrap have been used successfully for this purpose.)
2. Are fan blades or shanks corroded?  
If so, determine from the loss of cross-section area if the blades are satisfactory to continue in operation. Note any extensive corrosion in a particular area for future reference.
3. Fan blade material
4. Fan hub material
5. Clean blade and hub surfaces and inspect for any cracks. Sketch components and locate any cracks or extensive corrosion for future reference if these components are to be continued in service.
6. Record fan blade pitch angle.
7. Is the clamping assembly for the blade shank free from rust?  
If not, clean and apply protective coating.
8. Check clamping arrangement to be sure clamps are drawn up tight. Check manufacturer's recommendation for torque to apply to bolts or

cap screws. What is this torque recommendation?

9. Is hub cover rusted or loose? .....  
Clean and coat or tighten as required.
10. With mechanical equipment operating at full speed, check for excessive vibration at fan frequency. If excessive vibration is found, correct cause as recommended in manufacturer's instruction manuals.
11. Comments: .....

#### G. FAN CYLINDERS:

1. Type of fan cylinder (redwood, steel, presited segments, plywood segments, other)? .....
2. Fan cylinder height? .....
3. Check and record horizontal fan blade tip clearance, using a specific blade number to take measurements at eight points or more around the fan cylinder. Blade number .....  
Tip clearance data .....
4. Any loose or missing members in fan cylinders? .....  
If so, secure in place or replace as required.
5. Is the fan cylinder securely anchored? .....  
If not, tighten bolts or replace bolts as required.
6. Is there excessive corrosion of members of the fan cylinders or cylinder supports? .....  
If so, clean and apply protective coating or replace.
7. Are any members in such condition that they could endanger the fan? .....  
If so, replace or repair.
8. Comments: .....

#### H. MIST ELIMINATORS:

1. Is drift or mist a problem on this tower? .....
2. Type of eliminators (Two or three pass, other) .....
3. Are eliminator blades spongy or limber? .....
4. Do eliminator blade frames support eliminator blades adequately? .....
5. Are there any broken eliminator blades or eliminator support members? .....
6. What repair or replacement of eliminator blades or frames is required? .....
7. Is there rot in the eliminator blades? .....
8. Is there any clogging of the eliminators? .....
9. Comments (Include any repair or replacement required) .....

#### I. AIR INLET LOUVERS:

1. Are all air inlet louvers in place? .....  
If not, how many replacements are required? .....
2. Are louvers free of objectionable deposits? .....  
If not, can the deposit be remove by washing, scraping, or other? .....
3. Is there any splitting, bowing, or breakage of louver supports? .....  
If so, what correction is required? .....
4. Comments: .....

#### J. PARTITIONS:

1. Are there loose or missing boards? .....  
If so, list the material required to repair. ....

2. Is there any deterioration of nails? .....  
If so, show material to replace. ....
3. Do partition access doors require repair? .....  
If so, list repair materials required. ....
4. Do partitions go down to cold water level? .....
5. Comments: .....

#### K. OTHER COMPONENTS:

List other components in the air stream or connected with the air stream and detail their condition and any repairs required.

### WATER SIDE

#### A. WATER DISTRIBUTION SYSTEM:

1. Is water equally divided between cells? .....  
If not, adjust valves.
2. Is the water evenly distributed through the fill in each cell? .....  
If not, check for clogging of spray nozzles, diffusion decks, or distribution basins and correct as required.
3. If pipe, is there corrosion present? .....  
If so, clean and apply protective coating.
4. Is there evidence of excessive corrosion on flow control valves or valve operating mechanisms? .....  
If so, clean and coat or grease.
5. Objectionable cracks in wooden troughs? .....  
If so, replace members or repair.
6. If wooden basins, are there any objectionable cracks or leakage points? .....  
If so, repair or replace components.
7. Are nozzles & troughs free from obstruction? ..  
If not, clean as required.
8. Nozzle material and orifice size? .....
9. Approximate gpm pumped over the tower. ....
10. Water treatment used .....
11. Comments: .....

#### B. WATER DISTRIBUTION SYSTEM SUPPORTS:

1. Is there any noticeable misalignment? .....
2. Is the hardware corroded and losing strength? .....
3. Do the wooden members show signs of rot? ..
4. Is the wood soft in the vicinity of bolts, iron, nails, or iron pipe? .....
5. List any materials required .....

#### C. CASING:

1. Is the casing leaking? .....
2. Are the boards loose or missing? .....
3. Is some renailing needed? .....
4. Condition of nails? .....
5. Comments and materials required .....

#### D. DIFFUSION DECKS:

1. Is water evenly distributed over cells? .....
2. Are diffusion decks in place? .....
3. Any clogging of decks? .....
4. Are the supports in place? .....
5. Comments and materials required .....

#### E. FILL:

Furnish the proper information to accurately describe the condition of the fill.

### FILL IN TOP 1/3 OF TOWER

1. Does the water fall evenly through this section of the fill in each cell? .....
2. Part of fill collapsed. .... %
3. Part of fill sagged. .... %
4. Are fill pieces cross-checked and do they break squarely across the grain? .....
5. Are fill pieces grooved? .....
6. Have fill pieces lost dimension? .....
7. Does surface of fill pieces appear (Circle description) Fuzzy, Crumbly, Neither? Other .....
8. Comments Including material required .....

### FILL IN CENTER 1/3 OF TOWER

1. Does the water fall evenly through this section of fill in each cell? .....
2. Part of fill collapsed. .... %
3. Part of fill sagged. .... %
4. Are fill pieces cross-checked and do they break squarely across the grain? .....
5. Are the fill pieces grooved? .....
6. Have fill pieces lost dimension? .....
7. Does surface of fill pieces appear (Circle description) Fuzzy, Crumbly, Neither? Other .....
8. Comments (Including material required) .....

### FILL IN BOTTOM 1/3 OF TOWER

1. Does the water fall evenly through this section of fill in each cell? .....
2. Part of fill collapsed. .... %
3. Part of fill sagged. .... %
4. Are fill pieces cross-checked and do they break squarely across the grain? .....
5. Are fill pieces grooved? .....
6. Have fill pieces lost dimension? .....
7. Does surface of fill pieces appear (Circle description) Fuzzy, Crumbly, Neither? Other .....
8. Comments (Including material required) .....

#### F. BASIN:

1. Is normal operating level at design point? .....
2. Is the basin leaking at any point? .....
3. Is there evidence of sulfate attack? .....
4. Does basin need cleaning? .....
5. When was basin last cleaned? .....
6. Comments: .....

#### G. SCREENS:

1. The frame metal is .....

2. The screen metal is .....
3. Are the screens free of corrosion? .....
4. Are screen guides or superstructure corroded? .....
5. What kind of protective coating? .....
6. Will screen arrangement prevent rocks and water-logged wood from entering pump section? .....
7. Comments: .....

### STRUCTURE

#### A. STAIRWAYS AND LADDERS:

1. Inspect for loose or broken treads or rungs. Repair or replace as required. ....
2. Inspect and tighten as required bolts, nails and braces. ....
3. Inspect and tighten hand and knee rails as required. ....
4. Comments (Including a list of any replacement material required) .....

#### B. WALKWAYS AND CATWALKS:

1. Inspect for loose or broken treads. Repair or replace as required. ....
2. Inspect support members. Repair or replace as required. ....
3. Comments (Including a list of any replacement material required) .....

#### C. FAN DECK FLOORING AND SUPPORTS:

1. Inspect for splits, broken members, loose fasteners. Repair as required. ....
2. Inspect and probe for indication of wood rot. Record areas and locations of any pockets found (Include sketch if necessary). ....
3. Comments (Including list of any repair or replacement material required) .....

#### D. COLUMNS, GIRTS, AND DIAGONALS:

1. Record dimensions: .....  
Columns      Girts      Diagonals  
Compare with previous dimensional data for indication of reduction in cross sectional area. ....
2. Inspect and probe members for indication of wood rot or surface deterioration. Record area and specific location of any rot pockets found. Include sketch if necessary. ....
3. Are bolts weakened by corrosion? .....  
Replace as required. ....
4. Are bolts tight? ..... Tighten as required. ....
5. Comments (Including a list of any replacement material required) .....

Correct use of the above chart leads to immediate correction of conditions that require action to prevent costly downtime. Yet it permits on-the-spot preparation of lists of material for later repair or replacement of components whose condition and functions do not constitute a hazard to personnel or moving parts.

Following the annual spring "tune-up," a check list type of in-

spection at monthly intervals will catch and permit correction of minor items before they become extensive and costly.

Such a check list can be patterned on the above general topics with columns indicating the condition of components as "good," "repair," or "urgent repair." The inspector needs only to check the appropriate column for each component and refer the report to the

maintenance department for any action required. These monthly check lists should become a part of the permanent file, along with a record of all corrections made as a result of the report.

Annual or semi-annual thorough inspection, maintenance attention, and comparative testing helps the cooling tower to continue to perform at maximum efficiency and at minimum maintenance cost.



## Duct Joints Sealed with Iron Cement

**SEALING** duct joints at Unit #5 of Duke Power Company's new Allen Plant, scheduled for completion in July, 1961, is being accomplished with an iron cement. The joints are uniformly sealed and rendered absolutely air- and gas-tight by this method rather than by welding or use of gaskets.

The iron cement is being used where duct flanges connect either with each other or with other equipment such as preheaters, fans and precipitators. Some 180 duct joints with a total length of perhaps 5,000 feet have been sealed with Smooth-On No. 3, an iron cement made by Smooth-On Manufacturing Company.

Installation of Unit #5 will complete the Allen Plant, the latest facility added to the Duke Power system as part of a construction program to meet the growing need for electricity in the company's service area. When completed, Allen will have a capacity of 1,175,000 kw. Cost of the new plant, near Belmont, North Carolina, is expected to exceed \$100 million.

Duct joint sealing at Allen #5 is a demanding operation, partly because no leakage can be tolerated but also because the unit, with a nameplate rating of 275,000 kw, requires exceptionally large ducts. All the ducts were designed by Duke Power Company. The largest gas duct is more than 20 feet high and extends about 100 feet across the front of twin furnaces. Cold air ducts weigh 33 tons, hot air ducts 148 tons, and cold gas ducts 202 tons.

In view of the size of these ducts and the inside and outside pressures involved, it has been necessary to stiffen the plates with channels and beams outside and with truss-type pipe bracing inside.

Sealing joints in these exceptionally large ducts could have

been done either by welding, by use of gaskets with close bolt spacing, or by application of iron cement with close bolt spacing. The last method was chosen for reasons of economy and ease of application. Also, use of Smooth-On No. 3 makes it possible to take the ducts apart, if necessary, without undue difficulty. Being able to disassemble the ducts, particularly where dampers and expansion joints are concerned, is considered a definite advantage over welding.

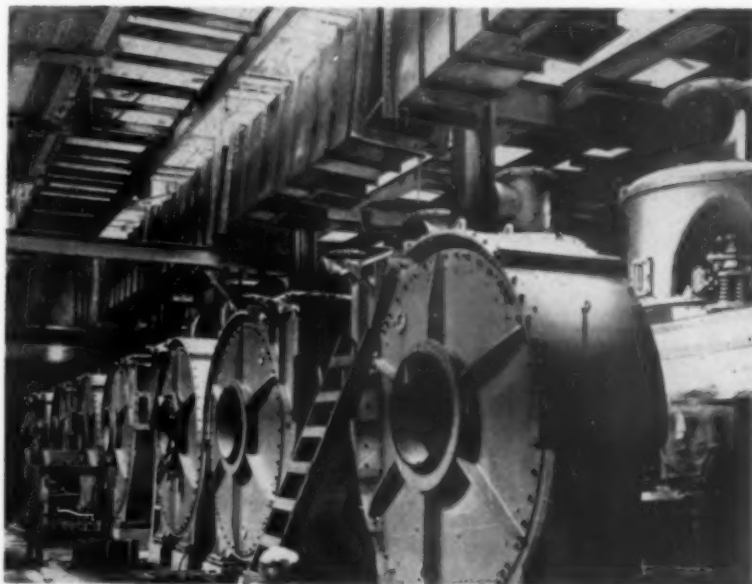
The size of the largest joints in each type of duct sealed with Smooth-On gives some indication of the extent of these sealing applications. For the cold air ducts the largest joint sealed with the iron cement measures 23'3" x 10'2½"; the largest hot air duct joint measures 15'3" x 10'0"; the largest cold gas duct joint sealed

this way is 24'0" x 10'2".

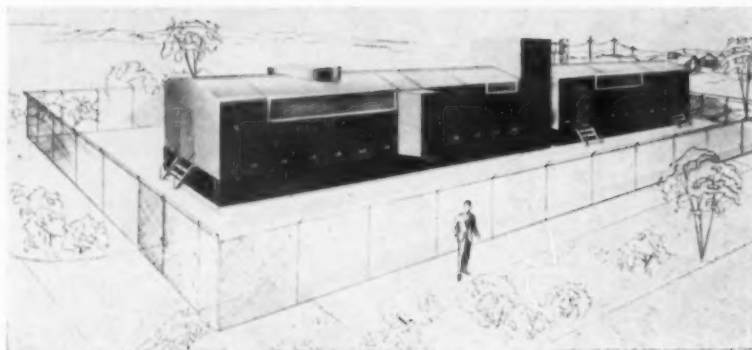
In the cold gas ducts these seals must withstand temperatures up to 265 F and vacuum up to 18" wg. In the hot air ducts temperatures may be as high as 586 F. Maximum pressure in the air ducts is 15" wg.

Use of iron cement in Duke Power Company's construction program goes back to 1925 when Buck Steam Station, the company's first pulverized coal-fired plant, was completed. Originally Smooth-On was used primarily to seal joints in sheet metal fan housing or to seal flanged joints of hot and cold air and hot gas ducts. The material was also buttered on the faces of pipe flanges. More recently, in the post-war construction program, it has been applied extensively to the faces of connecting air and gas duct flanges in lieu of gaskets.

Iron cement will be applied to the openings for expansion joints seen here. These are small ducts for hot air to the pulverizer mills.



## Package Gas Turbine Generators



**\$100 PER KW**

**SOUTH CAROLINA** Electric and Gas Company has purchased four General Electric gas turbine package power plants. This is the first sale of the completely new power plant announced by the manufacturer on Nov. 17.

After installation of these units and completion of the Carolinas Virginia Nuclear Power plant, South Carolina Electric & Gas Company will be marketing electricity generated from five sources of energy — water, uranium, natural gas, oil and coal. The use of natural gas as a fuel was an important consideration in the company's interest in the G-E package plant because SCE&G recently installed more than 200 miles of natural gas transmission lines in its 23-county service area.

Automatic start-up and remote control features of the new gas turbine unit make it particularly economical for peaking and emergency service. Typically, when heavy demands are made upon the system during the summer, it is necessary that the company have a source of stand-by power that is not too costly to build and maintain. The package plant answers this need. Its initial cost and operating expenses are reasonable and thus contribute to a continued low power rate. Adding also to its economical features is the fact that it is an unattended power station.

The new General Electric gas turbine package power plant is a

compact, self-contained generating station capable of operating on a system in conjunction with other generating equipment, or at a completely isolated location. It can start without any external source of power and can be on the line at full load in approximately fifteen minutes.

The overall dimensions of the installed package power plant are approximately 80 feet long and 35 feet wide. The plant has a net station rating for peak-load service of 10, 750 kw. It is a complete and integrated power plant consisting of two basic units plus accessory equipment. The turbine can be operated on either gas or distillate fuel.

The power package contains — within a common housing — the gas turbine, complete controls required for local or remote operation, mechanical and electrical auxiliaries, batteries and battery charger, closed-loop cooling system, and starting equipment.

The generating package contains — within a similar common housing — the generator, reduction gear, exciter, neutral current transformers, field breaker, discharge resistor, metering shunt, and generator air filter system. Accessory equipment includes inlet and exhaust ducting and the outdoor metal-clad switchgear compartment.

Key features of these new package power plants are: low initial

cost, maximum site flexibility, fast installation, and minimum operating expense. Standardization of design, factory assembly and testing plus the minimum space requirements of the package plant contribute to low initial cost. A cooling system using no external water and the ability to start and operate while isolated from the system permit maximum site flexibility.

Remotely controlled unattended operation along with an optional dual-fuel (gas or distillate oil) system help keep operating costs low. The dual fuel system can be arranged for change under load or while shutdown and permits the use of more economical fuel.

Whether being started, operated, or on standby, the package plant requires no attendance. All the starting, synchronization, operating, and shutdown functions can be initiated and controlled from a remote point. And during shutdown or standby the package plant is fully protected, ready to go on the line in only 15 minutes.

While offering these and other features, the new package power plant can be purchased as a peak-load station for no more than \$100 per kw including labor and direction of installation. The only items not included in the package-plant price are the land, foundation, required fuel storage and handling equipment, distribution facilities, and local transportation from the nearest rail siding.

The entire package-plant installation will fit on a quarter-acre house lot. Conservative estimates indicate that with nominal advanced site preparation, a packaged plant can be started within ten days after arrival at the site.

Space is provided in the control room to make station attendance quite feasible if desired, and it has

been designed to permit separation from the rest of the power package. The control components are standard metal enclosures containing supervisory, generator, turbine, and accessory controls. Station batteries are located under the control room floor and a 500 gallon fuel day tank will be mounted above the control cabinets.

The "Power Package" compartment contains the starting engine and a major share of the turbine auxiliary equipment. Specifically, key components include the closed loop cooling system comprised of a roof fan and radiator surfaces in the side of the enclosure, the starting diesel, the accessory gear which transmits starting power to the turbine and drives several of the station auxiliaries, a turbine gage panel, plus the piping and valves required for turbine fuel, lubrication, and so forth. The box-like assemblies, seen in the photograph, projecting from the side of the enclosure, are the air inlet ducts for the gas turbine.

The gas turbine alone is located in an adjacent compartment, and as noted earlier, the turbine can be operated on either gas or distillate fuel — when required, an optional dual-fuel system can be included. The dual-fuel option of course increases plant flexibility and of particular significance is the fact that station peak rating is the same for either gas or distillate fuel.

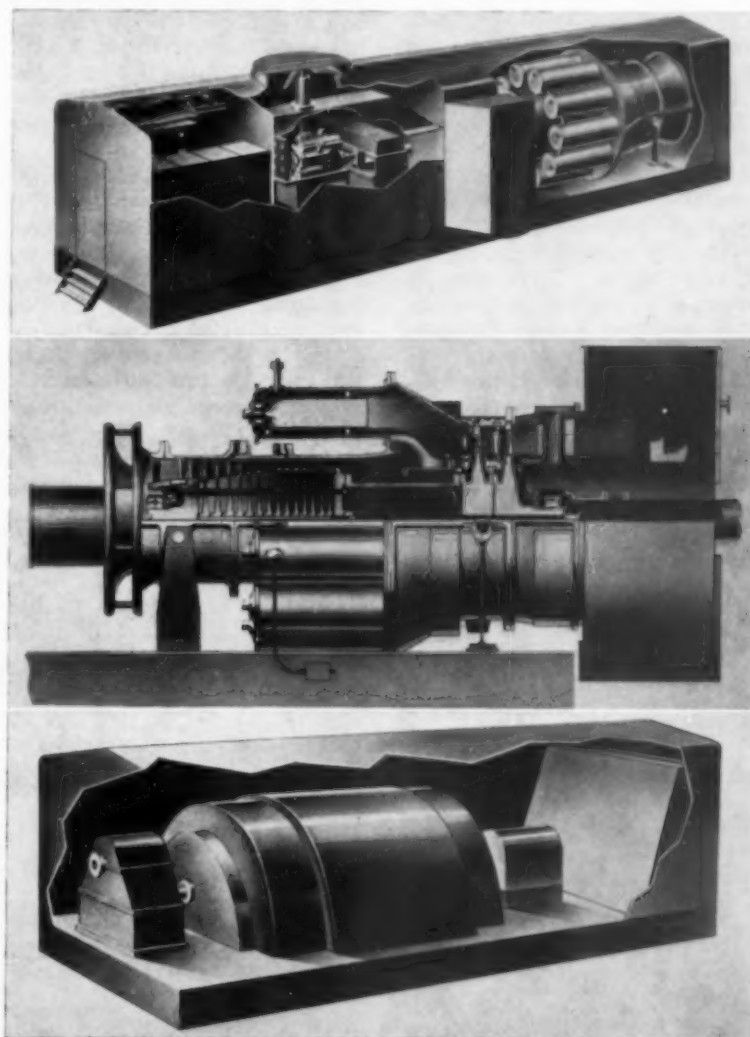
The trim all-weather enclosure of the power package provides ad-

equate thermal and acoustic insulation. Lights, heating, and fire protection equipment are also included. The unique design of the enclosure greatly simplifies minor maintenance and inspection work. The hinged side panels can be raised to form a protective roof while maintenance work is in progress — also the plates covering the "I" beam base are hinged and become a walkway during maintenance work.

The turbine shaft passes through the stack and is connected to a reduction gear, which in turn is coupled to the generator. The cut-away view shows the general arrangement of the components in the generator package. Starting from the left they are reduction gear, generator, exciter, and generator cooling air filtering system. The enclosure for this unit is of

the same general appearance and design as the power package.

Conventional outdoor metal-clad switchgear for the plant will be located immediately outside the generator package. While this completes the list of basic package plant components, several optional extras are available. For instance, air filtering and cooling equipment is available. Evaporative cooling of inlet air will be particularly desirable for operation at high ambient temperature conditions to increase turbine output. Filtering will of course be required for plants located in areas where heavy dirt and dust contamination may cause turbine blade erosion. Additional optional equipment includes an engine driven auxiliary generator for completely isolated plants and the dual-fuel system mentioned earlier.



Heart of the new gas turbine package power plant is the 11,000-kw gas turbine. All associated accessories and controls are packed within the 40-foot-long unit. Entire power unit, including trim all-weather housing, is sized to permit normal rail shipment. Power package leaves factory fully assembled, tested and ready for service.

The generator for the new gas turbine package power plant is rated 16,000 kva for peaking. It is mounted on an integral structural steel base and housed in an all-weather enclosure.

# Lube Oil Analysis

## A Tool In Preventive Maintenance

**OF WHAT VALUE** is lube oil analysis to the equipment operator and his maintenance program? Is lube oil analysis practical? Just what is the why, when and where of lube oil analysis? Practical answers are given in this article which is abstracted from a paper given at the Natural Gasoline Association of America, Panhandle Plains Regional Meeting in Amarillo, Texas.

**SIGNS** and indicators telling the operator when something is going wrong with his equipment is the theory on which a preventive maintenance program works. It will now be shown how we use lube oil analysis as one of these signs and indicators and how we use these tests as a practical tool in preventive maintenance.

Lube oils are very complex compounds and may contain several thousand different types of molecules. Many of these molecules are known as unsaturates; that is, the molecular structure is incomplete or very unstable. This type of molecule frequently changes its form completely when stabilized under heat and/or pressure conditions. This new form may be a varnish, gum or resin.

Also, oxidation of the oil takes place under certain conditions resulting in the formation of free carbon. During this oxidation hydrogen is liberated which, in turn, combines with other compounds to

form fatty acids. None of these new forms are lubricants and the fatty acids readily attack equipment parts.

Apart from the internal changes of the lubricating oils contamination of the oil from foreign materials such as water, dirt, blowby gases, excess fuels and metal particles worn from the equipment may render the oil useless or unsafe for lubrication.

Today's lube oils, however, are built to resist or endure most of the above conditions and, following proper recommendations, experience has 99% proved that it is not the lube oil that causes the machine to fail but that it is conditions in the machine or engine that cause the lube oil to fail.

In other words, when tests show the lube oil to be failing it only points to something wrong causing it to fail. Thus, the theory "keep a check on the lube oil to keep a check on the engine."

This is exactly what the Na-

By **WILLIAM E. SCRUGGS**

Mechanical Engineer  
Mobil Oil Company  
Dallas, Texas

tural Gas Department of Mobil Oil Company (formerly Magnolia Petroleum Company) has been doing since initiating its lube oil analysis program some nine years ago. We believe it has been a very practical program and is becoming more valuable as we become more experienced with it. The accompanying table (Information for Interpreting Lube Oil Tests) shows how analyses may be interpreted.

### Lube Oil Sampling

In order for a sample to be a true sample it must properly represent the flow of oil being furnished the engine or turbine. In Figure 1 two typical large horsepower engine lubrication systems are shown: one system using full flow filtration; the other system using bypass type filtration. As can be seen, the point of sampling is on the oil return line. Everything that has been done to the oil, including contamination from an outside source, if possible, will be reflected in a sample of oil taken here.

Certain pertinent data is also taken at the time of sampling. A picture of the sample data sheet is shown in Figure 2. This data sheet accompanies the oil sample to the laboratory and is used later in helping to interpret test results.

At the present time an oil sample is taken from all of Mobil's large horsepower engines and steam turbines every four months, the sample schedule being stag-

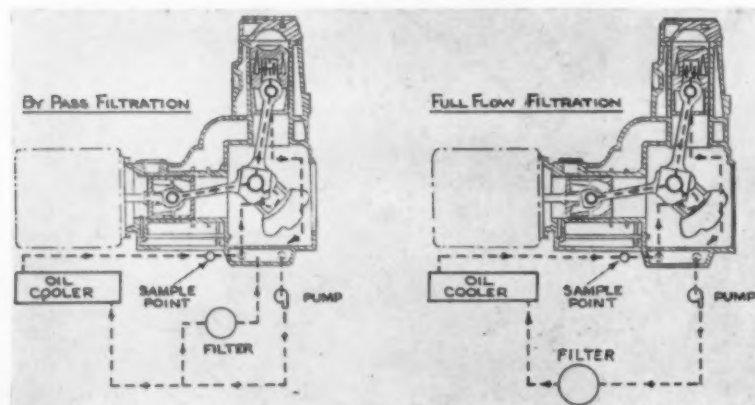


Fig. 1. Lubricating Systems



gered so that a given number of samples reach the laboratory for analysis each month.

### Tests on the Sample

In Figure 3 a Lubricating Oil Result Sheet is shown. All of these tests are standard ASTM or Federal Stock Catalog designated tests.

It has been found through experience that the tests on Viscosity, Water Percent by Weight, and Neutralization Number are the best indicators for engine crankcase oils. When something is wrong with an engine these test values change quicker and at a greater rate than any of the other values tested. Normally, these three tests are all that are run on samples of engine crankcase oils and the three make up what is called a standard test.

Such a test is shown under Field Sample No. 2. However, should any of the results of the standard test exceed approved limits, a more complete test is run in order that more information is available for evaluating the oil and for determining the cause of its failure. This complete test is shown in Field Sample No. 1.

The above has proved almost the same with tests run on turbine oils; the most useful tests on turbine oils being Water % by Weight and Neutralization Number. These two comprise the standard test for turbine oils. The standard test for turbines is shown under Field Sample No. 4. The

complete test is shown under Field Sample No. 3.

Considerable money is saved by being able to run only the shortened tests. The intra-company laboratory charges are: \$41.00 for a complete test; \$15.00 for a standard test on engine crankcase oil, and \$10.00 for a standard test on turbine oil. In most cases these and/or other lube oil tests are furnished as a free service by the lube oil supplier to his customers.

### Significance of Tests

The table "Information for Interpreting Results of Lube Oil Tests" covers a complete test run on oil samples but since the standard tests have been the more important tests, let us look at their significance.

### Viscosity (ASTM D-88-56)

This test is a measure of the resistance to flow of the oil due to internal friction and has often been termed the most important single property of a lubricating oil.

This property is important due to the inherent design of the engine or turbine where viscosity is depended on to give a certain "body" to the oil for proper bearing lubrication; also, the viscosity is important in maintaining certain oil flow rates for proper cooling of bearings, pistons and other parts.

An increasing viscosity is most probably caused by oxidation of the oil due to excess heat from hot bearings, blowby of hot gases,

excessive operating temperatures and related conditions. A decreasing viscosity, which is rarely ever found in natural gas fueled engines, indicates dilution from an outside source.

### Water, % by Weight (ASTM D95-56T)

This is a measure of the water content of the lube oil. Water content should always be "nil." A trace or more of water is cause for immediate action. One source of water is from combustion of the fuel, the water either condensing on relatively cool cylinder walls and being washed and wiped by the piston rings into the crankcase, or by blowby of the water vapor with other blowby gases into the crankcase.

Low jacket water temperature aids in condensation of the water vapor on cylinder walls. Low lube oil temperatures combined with bad crankcase ventilation help in condensing water vapor in the crankcase. Another source of water is leaks in oil coolers and cooling water jackets.

### Neutralization Number (ASTM D974-55T)

Neutralization Number is a measure of the acidity of the oil. Since the advent of additive treated oils, the significance of this test has become greatly complicated and has been the subject of many controversies. An oil may test acidic when new, thereby making the absolute values of this test of

Fig. 2. Lubricating Oil Data Sheet

SUBJECT: LUBE OIL SAMPLE SHIPMENT

Following is data on lubricating oil samples shipped this date from Gasoline Plant to the Natural Gasoline Laboratory for Testing:

Sample Number	1	2	3	4
Sample From Engine No.	E-1	E-2	T-2	T-3
Date Sample Taken	9-9-59	9-9-59	9-9-59	9-9-59
Type Engine	GRV-10	GRV-10	G.E. Turbine	G.E. Turbine
Type Oil	M-4D	M-4D	T-2H	T-2H
Tests to be Made	Std.	Std.	Std.	Std.
Operating Hours Since Oil Change	10,013	8,000	56,000	59,000
Engine Temperature, °F	Water Jacket In	140	160	
	Out	150	170	
	Lub. Oil In	120	155	140
	Out	130	165	154
Type Filter	Filter Material	Cotton & Rayon	Paper	Paper
	Manufacturer	Hilco	Hilco	Hilco
Date Filter Changed	8-11-59	8-11-59	8-11-59	8-11-59
Place Where Sample Taken	Oil Return Line	Oil Return Line	Sump	Sump
Remarks:				

Fig. 3. Lubricating Oil Results Sheet

SUBJECT: RESULTS OF LUBE OIL TESTS ON SAMPLES TAKEN AT \_\_\_\_\_

Date Sampled: \_\_\_\_\_  
Date Received at Lab: \_\_\_\_\_  
Date Tests Completed: \_\_\_\_\_

Field Sample Number	TEST RESULTS			
	1	2	3	4
Source	#1 Engine	#2 Engine	#3 Turbine	#4 Turbine
Laboratory Number	L-4108	L-4109	L-4110	L-4111
Type Oil	M-4D	M-4D	T-2H	T-2H
Insoluble in Chloroform	0.08		0.02	
Insoluble in Pet. Ether	0.12		0.05	
Ash, % by Wt.	0.50		0.00	
Water, % by Wt.	1.2	N11	0.2	N11
Viscosity at 210° F., SSU	87.5	82.0	55.4	
Neutralization Number	1.5	Less 0.8	0.4	0.1
Rust				
S. E. Number				

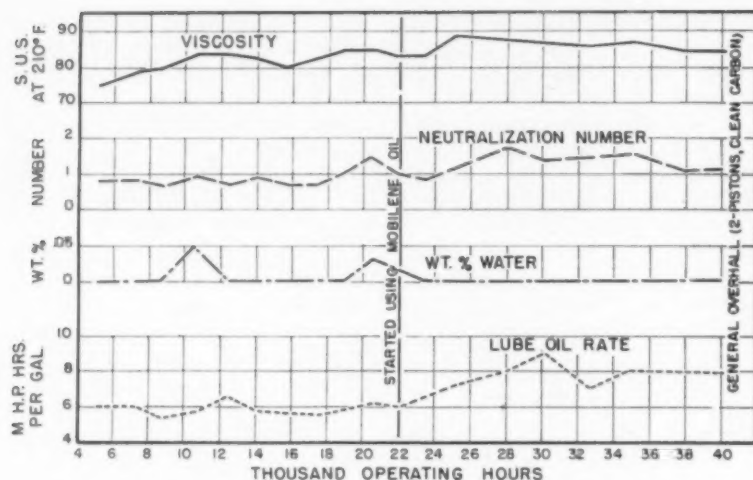


Fig. 4 — Case 1 — Gas Engine Lube Oil Test Results vs. Operating Hours

little importance; however, when the neutralization number of the original oil is compared with the neutralization number of the used oil the test has some significance.

Even here there is a considerable difference of opinion as to what effect an increasing neutralization number has in relation to corrosion of acid sensitive metals and we offer no definite statement. In using this test we interpret an increasing neutralization number to indicate that there is excess oxidation going on in the oil and that the cause of the oxidation should be found and eliminated.

It was found that plotting the test results gave a more complete

picture of what was going on than would just a table of values.

Figure 4 shows a set of plotted test results. Normally, only standard test values are plotted. To make the plotting more meaningful, all test results are plotted against thousand hours operation on the oil. Also added for engines, is a plot of the lube oil consumption. Lube oil consumption, hence lube oil make-up, has a direct relationship to lube oil test results.

#### Results Analysis Program

The first results of the program were savings in engine crankcase and turbine oil changes.

Previous to the lube oil analysis

program our maintenance people were faced with the problem of when to change oil in certain units and, not being willing to take a chance with costly equipment, changed the oil out just to be safe. Now they are no longer faced with this problem.

If oil in an engine or turbine is questionable they simply have a sample analyzed. Then they know whether they should change the oil or not. Considering the fact that many engine lubricating systems hold \$350.00 worth of oil and some even more, the economics of this is easily seen.

The real value of this program, though, has been the aid it has given to our maintenance people in their preventive maintenance program.

Taking and analyzing an oil sample from an engine is like feeling the pulse of a human being. The results of an oil sample analysis is a direct indication of the condition of the engine.

To see this better, let us look at some lube oil test results where these results have been used in indicating troubles with engine and turbines.

#### Case No. 1

Figure 4 is a plot of the lube oil analysis test results for a two cycle natural gas engine. This engine has been in service for almost five years with no major repairs needed. The fact that this engine was in good condition over this period is reflected in the test results.

One thing that is significant is that at two times in this five-year period test results showed the oil to contain some water. The water, caused by low lube oil temperature which was attributed to a faulty temperature control that allowed the engine jacket water temperature to run too low, was quickly eliminated. There were no damaging effects to the engine. Had the water remained in the lube oil, considerable damage could have been done to the engine.

#### Case No. 2

Figure 5 is a plot of the lube oil analysis test results for a large steam turbine. There are three identical turbines at this installa-

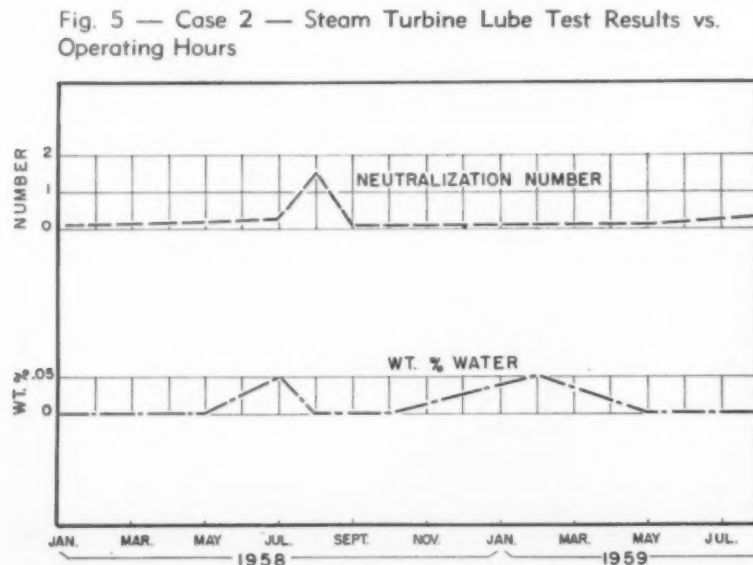


Fig. 5 — Case 2 — Steam Turbine Lube Test Results vs. Operating Hours

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**TEST — Viscosity  
(ASTM Designation D-88-56)**

**SIGNIFICANCE**

This is a measure of the resistance of the oil to flow due to internal friction. This is probably the most important single property of the oil. The viscosity of the oil should be kept within the limits recommended by the manufacturer.

An increase in viscosity is usually caused by oxidation of the oil or by contamination of the oil by the products of combustion.

**POSSIBLE CAUSES**

1. Engine oil temperature too high.
2. Engine jacket water temperature too high.
3. Blow-by from stuck or worn rings.
4. Fuel mixture too rich, causing excessive firing temperatures.

A decrease in viscosity is a rare occurrence in natural gas fueled engines, but would indicate dilution.

**TEST — Water, % by Weight  
(ASTM Designation D-95-56T)**

**SIGNIFICANCE**

This is an actual measure of the water contamination of the oil. Water content of the oil should always be nil. Water increases the viscosity of the oil and, if allowed to stay in the oil, will cause sludge formations. Any water content in the oil calls for investigation.

Two possible sources of water are: Products of combustion and water leaks.

**POSSIBLE CAUSES**

1. Low jacket water temperatures, allowing condensation of water on cylinder walls.
2. Low lube oil temperature, allowing water to condense in the oil.
3. Excessive blow-by past piston rings.
4. Bad crankcase ventilation.
5. Water leaks in oil coolers and (or) engine jackets.
6. Steam seal leakage on steam turbines.
7. Malfunctioning oil reclaimers on steam turbine.

**TEST — Neutralization Number  
(ASTM Designation D-974-55T)**

**SIGNIFICANCE**

This test is a measure of the acidity of the oil. A high test value may indicate corrosion ability of the oil. However, this should be relied upon only to indicate oxidation or contamination of the oil taking place. Fullers Earth Filters can be used on mineral oils to control neutralization number.

**POSSIBLE CAUSES**

1. Engine oil temperature too high.
2. Engine water temperature too high.
3. Blow-by from stuck or worn rings.
4. Fuel mixture too rich, causing excessive firing temperature.

**TEST — Ash, % by Weight  
(ASTM Designation D-482-46)**

**SIGNIFICANCE**

This test is an indication on contamination with dust, dirt, etc., of straight mineral oils only. Results of the test may be too complicated to indicate detergent loss or contamination. However, it may give an indication of engine wear.

**POSSIBLE CAUSES**

1. Dirty or ineffective air filter.
2. Ineffective oil filtration.
3. Excessive wear of engine parts.

**TEST — % Insoluble in Ether  
(Fed. Stock Cat. No. 311.1.1)**

**SIGNIFICANCE**

This is a measure of the total insolubles such as dust, dirt, gums, and tars.

**POSSIBLE CAUSES**

1. Dirty or ineffective air filter.
2. Ineffective oil filtration.
3. Excessive wear of engine parts.
4. Engine condition bad in general (see causes listed in other tests).

**TEST — Insoluble in Chloroform  
(Fed. Stock Cat. No. 311.1.1)**

**SIGNIFICANCE**

This is a measure of the insolubles that are contaminants. This test is run on the insolubles found in Petroleum Ether.

**POSSIBLE CAUSES**

1. Dirty or ineffective air filter.
2. Ineffective oil filtration.
3. Excessive wear of engine parts.

**TEST — Insoluble Difference**

**SIGNIFICANCE**

The difference between the values of the insolubles in Petroleum Ether and in Chloroform is a measure of the resins formed in the oil by oxidation and (or) thermal cracking.

tion. The first increase in water, and then the resulting increase in neutralization number shown for this turbine, was also present in the test results for the other two turbines. The trouble was traced to a malfunctioning oil reclaimers which serves all three turbines.

The second increase in water was present only in this turbine. The cause of the trouble was a ruptured steam seal allowing steam to enter the oil.

**Case No. 3**

Figure 6 is probably the best example of how lube oil analysis has given information to our maintenance people.

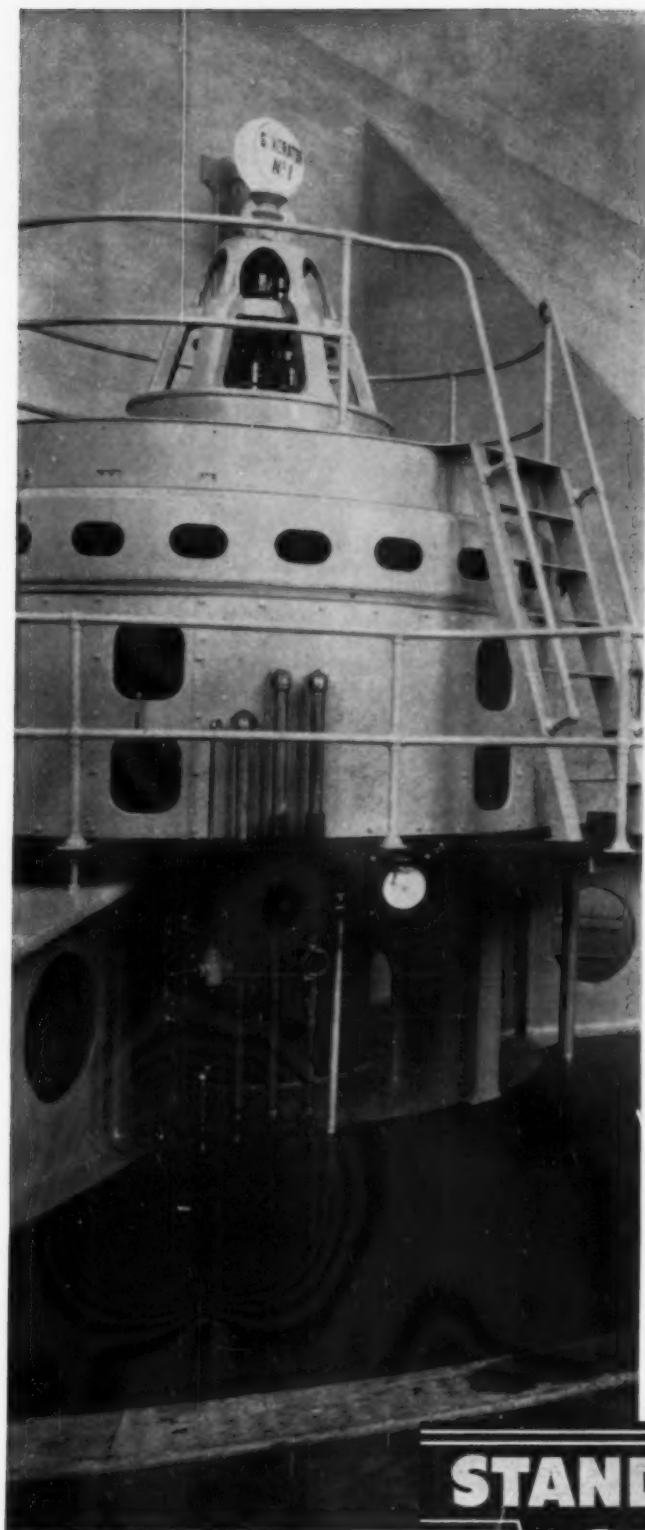
Looking at the plot of the lube oil analysis, test results for this two-cycle engine conditions were normal until about 22,000 operating hours. At this time the viscosity of the oil started rising slowly. The neutralization number

took a sharp increase. On checking the engine the scavenging air ports were found badly plugged with carbon.

Notice the abrupt drop of the neutralization number of the oil after the port cleaning; however, there was apparently still something wrong with the engine, as the oil now contained water, and soon viscosity started going up.

The engine was then taken off the line for general overhaul. One





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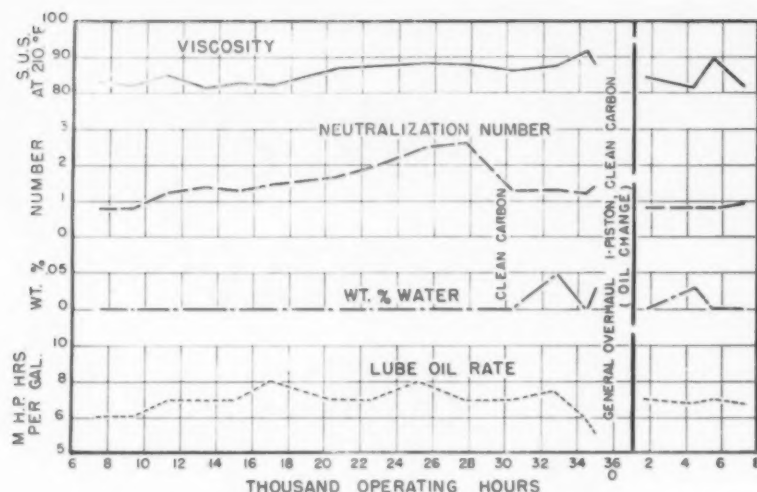


Fig. 6 — Case 3 — Gas Engine Lube Oil Test Results vs. Operating Hours

cracked piston was replaced and the oil was changed. Now the engine should have been in good condition. Apparently this was not true because water was present in the new oil even though the engine was completely overhauled. The last test shows the engine to be in good condition.

I think it has been seen that lube oil analysis does not pinpoint troubles but is used in conjunction with other signs and indicators in finding conditions before costly damage is done to the equipment.

#### Special Problems

Lube oil analysis is not confined as a tool for routine maintenance only; but it is also applicable to special maintenance problems.

We have run field tests on various makes and models of lube oil filters by sampling and analyzing the inlet and outlet streams to and from the filters. Also, the best methods of lube oil filter hook-up may be determined by the use of lube oil analysis.

A list here could be quite long, the only prerequisite to using lube oil analysis as a criterion being that the equipment to be tested, through its success or failure, has such an effect on the lube oil that this effect may be recognized in an analysis of the lube oil.

#### Limitations of Program

As much help as our lube oil program has been to our main-

tenance people, it has not placed them in a state of Utopia. There are, we have to admit, some limitations to our program. An example of such a limitation is the

following:

We have tried to pick up bearing wear in large reciprocating pumps having very high bearing load by regularly sampling and analyzing the oil in the pump crankcase. There was no success in this, though, as the bearings went out giving no indications in the lube oil test results.

Problems such as this could probably be solved by the addition of spectrographic analysis to the program. The recent report made by the American Gas Association concerning spectrographic analysis of lube oils looks very good for problems such as this.

#### Summary

We feel that lube oil analysis has been a very practical tool in our preventive maintenance program and that in the future through better sampling, analyzing, record keeping and interpretation techniques, maintenance people will be given even better and more complete information.

## Evaporator Controls

**SIX YEARS** of successful operation has proved that proper chemical conditioning of evaporators along with proper control of make-up, output and blowdown eliminates excessive scaling of tube bundles.

The automatic evaporator control system used in our power plants includes a recording evaporator feed rate controller and a recording evaporator blowdown rate controller — both mounted on the turbine gauge board. Flow of steam to the evaporator is controlled by a Leveltrol unit and a differential pressure cell.

The operator sets the desired evaporator feed rate into the recorder controller at the turbine gauge board and the corresponding blowdown rate is then set into its recorder controller which is also on the turbine gauge board. The Leveltrol controls the opening of the extraction steam valve to the

evaporator coils. As the water level rises more steam is admitted to the coils and as the water level lowers the steam is cut back. When the load is low and therefore the quantity of extraction steam is small the level in the evaporator will rise above the Leveltrol control point and then the differential pressure cell will cut back and eventually close the make-up valve.

With this evaporator control system and the necessary chemical controls the evaporator tube bundles are never "cracked" or descaled in any manner and there is no noticeable reduction in capacity. Vapor quality averages better than the 1 ppm T.D.S. guarantee. The evaporator shell is flushed out with a hose each year at overhaul and put back into operation.

By A. R. COX, West  
Texas Utilities Co.,  
Abilene, Texas

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*"We want 100 immediately. They meet our confined  
space needs perfectly."*

WISCONSIN PACKER

*"Ordering 60 as first part of new standardization  
program."*

LOUISIANA REFINERY

*"We'll start with 24—more later."*

OHIO PETRO-CHEMICAL

So it goes—industry's welcome to the new Yarway Series 130 combination steam trap has been a warm one. Already manufacturing quotas have been doubled to meet the demand. Yarway distributors everywhere are busy answering their customers' requests for demonstrations.

What will the new Series 130 do for you? Consider these advantages:

### COMPACT COMBINATION SAVES SPACE, MONEY, MAINTENANCE ON LIGHT LOAD APPLICATIONS

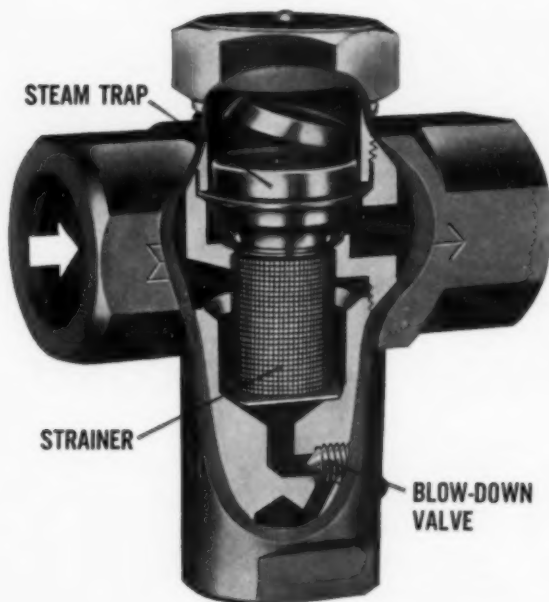
Steam trap, strainer, blow-down valve combination simplifies trapping hook-ups—saves up to 30% in time and materials over ordinary hook-ups.

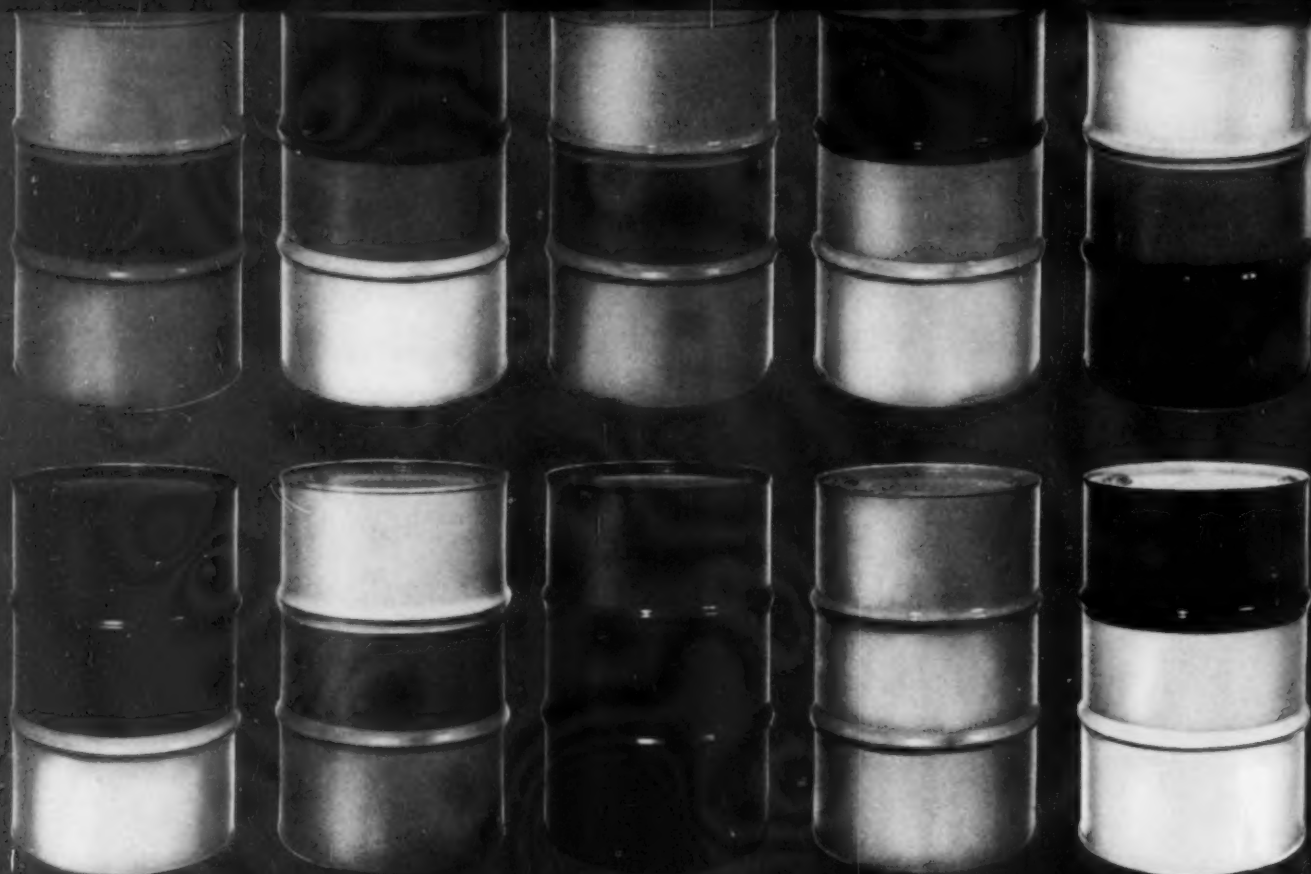
#### NO OTHER STEAM TRAP COMBINES SUCH COST-SAVING, WORK-SAVING FEATURES

All stainless steel construction, woven stainless steel strainer screen, replaceable trap valve-seat assembly, Allen wrench-operated blow-down valve—make maintenance easy.

Small size, light weight, good for all pressures 8 to 600 psi—make installations simpler.

Try this trap on your steam main drips, steam tracer lines, meter boxes or any other of thousands of light condensate load applications. Call your nearby Yarway distributor today—or write us for more details.





## Lubricant inventory—BEFORE



## Simplified lubrication with versatile inventories, cuts maintenance costs...

How many different lubricants do you carry in *your* inventory? Gulf engineers frequently find up to *five times as many as necessary are used*. Up to five times as many ordering, billing, handling, stocking problems. Five times as many chances for human error in lubricating expensive equipment.

At General Electric's Louisville, Kentucky, plant for example, lubricants were reduced from *dozens to six*. At the same time efficiency was improved.

This happens because Gulf engineers can relate their experiences with hundreds of lubricating problems to *your* problem. It happens because they can usually recommend these versatile Gulf lubricants: Gulf Harmony® Oil, Gulfcrown® Grease, Gulfcrown® Grease, E.P., Gulf® E.P. Lubricants.

You can simplify your lubrication program with multipurpose Gulf products. For additional information use the coupon.





## Lubricant inventory—AFTER



**Gulf® oils and greases reduces**  
**GULF MAKES THINGS RUN BETTER!**



**GULF OIL CORPORATION**

Dept. DM, Gulf Building  
Houston 2, Texas

Send me the booklets on Gulf Multipurpose Lubricants:

Name \_\_\_\_\_

Company \_\_\_\_\_

Title \_\_\_\_\_

Town \_\_\_\_\_ Zone \_\_\_\_\_ City \_\_\_\_\_

A detailed technical illustration of a soft-seat valve assembly. On the left, a perspective view shows a valve handle, stem, and plug assembly. On the right, a cross-sectional view shows the internal components, including the plug, seat, and backup rings. A circular callout provides a magnified view of the plug and seat interface. The background features a dark, swirling pattern.

# New Soft- Seat Design...

The soft-seat design provides tight shut-off through the normal flow path and a seal to prevent leakage through the threaded parts. The insert is fully retained in closed position, and is held with sufficient force to prevent blowout even at differential pressures in excess of 1000 psi. The insert is protected by metal-to-metal backup.

Soft-seat plugs are available in nominal sizes from 1" to 10". Inserts may be of Buna-N, Teflon or Glass Filled Teflon.

These materials are long lasting under conditions for which they are designed. Inserts may be replaced and materials are interchangeable.

20000 Series Valves may be converted to soft-seat trim in the field by installing plug and ring sets.

# **NOW!**

## **The Advantages of 20000 Series Valves plus TIGHT SHUTOFF**

### **without Sacrificing Capacity or Characteristics**

Now you can have high-capacity single-seated control valves with soft-seat tightness — without sacrifice of percentage characteristics. This design, moreover, permits static pressures and pressure drops up to 500 psi.

Soft-seat inserts of several materials are available to meet varying conditions. For example: *Buna-N* for temperatures to 200 F; *Teflon* for temperatures to 300 F and resistance to chemicals; *Glass Filled Teflon* for temperatures to 500 F, for

high-mechanical strength, corrosion resistance and for steam service. Metals available are identical with those normally used in metal-to-metal seating.

This new trim is a logical extension of the versatility inherent in the 20000 Series, designed to meet the growing preference for single-seated control valves. If you do not yet have information on the most versatile control valves available, ask a Mason-Neilan representative or write —



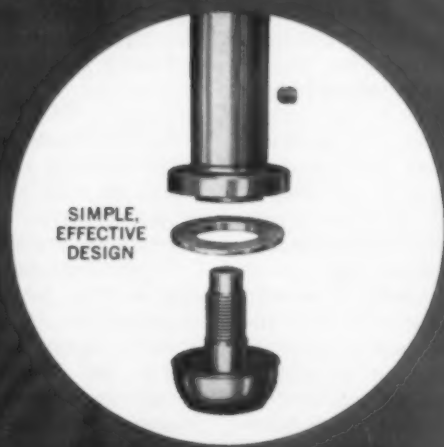
*Products that work for your profit*

## **MASON-NEILAN**

*Division of Worthington Corporation*

**35 NAHATAN STREET, NORWOOD, MASS., U.S.A.**

*Sales Offices or Distributors in Principal Cities in United States and Abroad  
In Canada: Worthington (Canada) Ltd., Mason-Neilan Division*



# Do You Have a Check List?

## Compressed Air System Maintenance

By **EDMOND C. POWERS**

Educational Director  
Compressed Air and Gas Institute

**MAINTENANCE** of the compressed air system includes the care of all units, components, and subassemblies — beginning with the prime mover and continuing along the distribution system to the using device (air powered machinery, pneumatic chuck or vise, pneumatic hand tool, conveying system, automatic control system, etc.). No item of auxiliary, or accessory, equipment may be overlooked because a single malfunction may adversely affect the entire system. A compressor in perfect running order, for example, is of little value if dehumidifying units are not performing properly.

It has been said that an owner who needs maintenance on his pneumatic system is already paying for it — in leakage of air to the atmosphere, reduced production and unnecessary rejects. The key to increased efficiency and to decreased downtime in a pneumatic system is preventive maintenance, which consists of preventing breakdowns—rather than resorting to corrective maintenance after some difficulty has occurred.

Preventive maintenance, in turn, relies on the basic process of insuring that properly trained personnel, equipped with the correct tools and materials, use successful methods.

There are many maintenance hints or short cuts that are of assistance — such as a color identification system for marking air piping to distinguish it from steam, oil and water lines, the use of metal spray-on powder to rebuild a worn compressor crankshaft, the use of compressed air to maintain pneumatic equipment (a sort of "boot-strap" method) or the use of an illustrated plant maintenance manual tailored for use in a specific plant. In this article, however,

only general practices will be discussed.

### Prime Movers

Compressor drives are an integral part of the compressed air system and should be viewed as such; they fall into three main classes: electrical motors, internal combustion engines and turbines, and steam engines and turbines. Variations exist within each main category, usually based on special operating conditions, but in general prime mover maintenance is based on regular and frequent inspection, proper lubrication, and attention to the manufacturer's recommendations.

Drive malfunctions, such as vibration, can adversely affect the compressor by causing heating. A vibration check should therefore be made, including proper drive-compressor coupling and alignment and a check for loose foundation fittings.

Overloading, which can cause the prime mover to overheat, may usually be detected by the physical senses (touch, smell, and sight). A layer of accumulated oil laden dust acts as an insulator and may also be the cause of driver heating, especially in air cooled units.

### Air Intakes

A screening device is often used, particularly in areas heavily contaminated with dust, sand or other contaminants, to filter the air entering the compressor.

These units must be checked regularly to insure that an accumulation of debris has not blocked the free passage of intake air to the compressor. Filters should be cleaned regularly and replaced periodically. (Some filters cannot be cleaned and must be replaced.)

The air intake may in some cases be combined with a silencer to form a filter-silencer unit. The air flow, after filtering, is directed through a series of baffles to reduce suction (or discharge) noise.

### Accessory Equipment

Auxiliary equipment used to support the air compressor in supplying clean, dry air at the proper pressure includes the aftercooler, receiver, filter, dehumidifier, lubricator, regulator, and combination units that regulate, filter, and/or lubricate.

The correct sizing of pneumatic equipment, including the compressor, accessories, piping and hoses, is very important and should be checked periodically to insure that all items have sufficient capacity to meet system requirements.

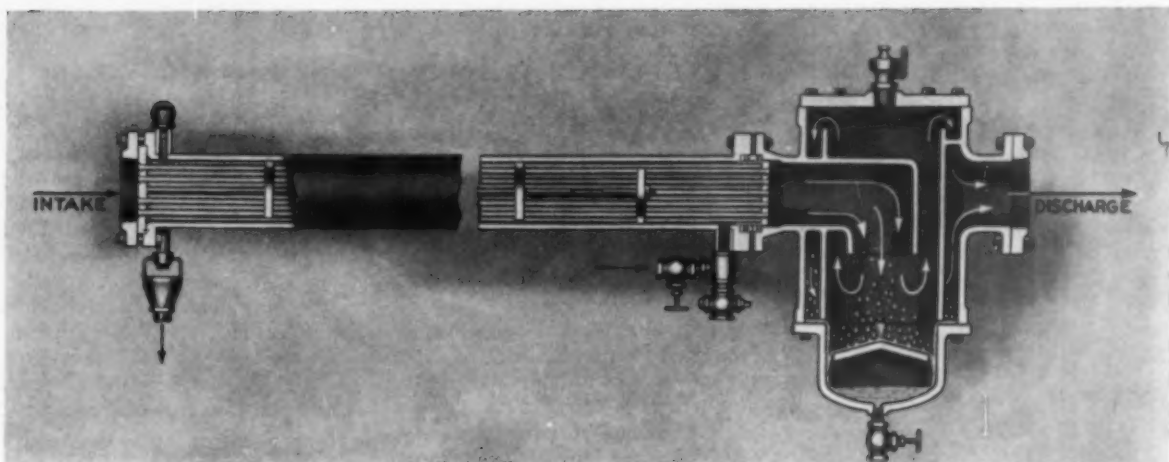
An undersized compressor can have a shortened life from constant operation. Inadequate filter, dehumidifying, regulating, or lubricating devices can cause damage by allowing dirt or water to pass into the system or by permitting improper pressures or poor lubrication.

### Compressors

In order to save space, only the most important factors in compressor maintenance, lubrication and valve care, will be discussed. Air compressors are, fortunately, relatively maintenance-free and have been known to run for 13 years without downtime.

A compressor may require several types of oil with individual requirements for power cylinder, bearings, and compressor cylinder. The best information on compressor lubrication is the manufacturer's service manual, which should be carefully studied by maintenance personnel. Care should be exercised to avoid over-lubrication, which can result in carbon deposits on valves and cylinders. Examination of the feed system will reveal this fault. Under-lubrication, on





Aftercooler (Courtesy of Joy Mfg. Co.)

the other hand, can cause dryness or the formation of rust.

The inlet and outlet valves are of the utmost importance to effective compressor operation and should be checked regularly for proper seating and freedom from cracks, carbon, and warping.

Daily inspection of the air compressor includes care of lines and pressure tank, turning it over by hand, check of unloading mechanism, and oil level and pressure checks.

Weekly maintenance includes checking belt tension and pulley alignment, cleaning cooling surfaces and filter, and a valve check for cleanliness.

Monthly procedures include a thorough check for leaks, and a bearing and valve inspection for wear.

#### Intercoolers

An intercooler is basically a heat exchanger used to remove the heat of compression between the stages of a multistage air compressor and thereby save power by reducing through cooling action the volume of air before it passes to the next stage of the multistage compressor.

The intercooler is designed to make available the greatest possible temperature reduction between the low and high pressure cylinders of the compressor with as little a pressure drop as possible. Cold water flows through tubing that is in contact with the warmer compressed air flowing around it. The direction of air

flow is changed several times by baffles so as to achieve maximum contact between warm air and cold tubes, and precipitated moisture is separated and drained before the air passes to its next compression stage.

Intercooler maintenance consists primarily in insuring that tubing does not restrict the flow of water and that precipitated moisture drains off.

A check of intercooler pressure is a good measure of over-all compressor operation. Each multistage compressor has but one correct intercooler pressure for proper operation. It should be checked daily.

At periodic intervals depending on use, intercoolers should be cleaned by flushing with a hot water and soda solution to remove oil film.

#### Aftercoolers

The aftercooler (Figure 1) is also a heat exchanger. Its main purpose is to cool the air after it is discharged from the compressor. Compressed air usually contains water vapor, and unless the water is removed soon after the compressed air leaves the compressor, it will condense in the distribution system and enter air-operated devices. The results in increased maintenance costs and inferior products are obvious. A secondary, though important, function of the aftercooler is to remove oil that has been picked up by the air as it passes through the compressor.

In the illustrated aftercooler, primary separation occurs in the

central compartment (velocity is reduced and flow is reversed). Additional velocity reduction and flow reversals occur later, and moisture and oil are trapped in the reservoir at the right bottom of Figure 1.

The compressed air flows through many small tubes, with cooling water flowing outside of the tubes. Baffles direct the flow of water to promote cooling; the tube nest is removable.

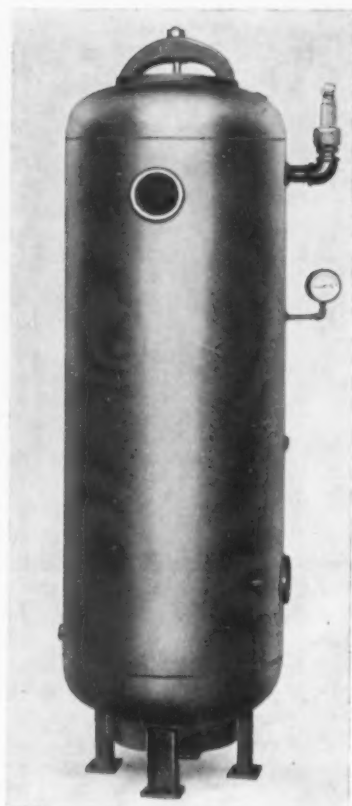
Inspection of the aftercooler includes a check of tube ends for leakage and water and air temperature readings. Major maintenance includes removal and cleaning of the tube assembly.

#### Receivers

An air receiver is a tank used to store air after it is discharged from the compressor and to dampen pulsations in the discharge line. The receiver therefore guards against wasted power input and unnecessary work.

Additional functions of the receiver (see Figure 2) are to prevent subjecting the compressor control system to undue wear by preventing unnecessary starts and stops and to deliver air at a steady pressure. By receiving air at reduced velocity, the receiver also provides for the removal of condensed water vapor and oil.

Maintenance of the receiver may be confined to a periodic inspection to insure that moisture and oil which have settled out of the air have not accumulated to the extent of cutting receiver capacity or



Receiver (Courtesy of Chicago Pneumatic Tool Co.)

allowing moisture or compressor oil to pass into the lines. Periodic draining will accomplish this check.

The filter separates (and removes) contaminants (both solid and liquid) such as dust, rust, spores, lint, grit, pipe scale and dope, and deteriorated compressor oil from compressed air. Each cubic inch of air entering a compressor may contain about one-half million contaminating particles. A 10-hp, 40-cfm compressor (providing some 70,000 cubic inches of air) would therefore deliver almost 15 billion contaminant particles per minute. Obviously, action must be taken to prevent these irritants from damaging pneumatic tools and machines, cylinders and motors.

Filters of many kinds are available, including 5000-psi units to screen out 40-micron particles, metal screens for 75-micron particles, those featuring sintered-metal elements, and high speed rotary units.

Maintenance of most filters con-

sists of checking for free flow in automatic drain units or insuring that sediment catching bowls are not filled to capacity.

### Dehumidifiers

Depending on local conditions of humidity, temperature changes, the effectiveness of the aftercooler and length of the pipeline, water may be precipitated in the piping. Some form of filter or drain must be provided at precipitation points to eliminate this moisture before it can enter pneumatic devices, and the dehumidifier serves this purpose.

It may be necessary to install individual water separators, or dehumidifiers, at places such as pipeline ends. These dehumidifiers may take one of several forms: (1) mechanical traps, (2) regenerating units which remove moisture by absorption and depend on the affinity between moisture-laden air and an agent such as activated carbon, and (3) replenished units which contain a dessicant in the form of pellets which are replaced periodically after pellets are dissolved by moisture.

Maintenance of a dehumidifier depends on its type and requires periodic emptying of a trap, regeneration of an adsorber, replenishment of the dessicant, etc.

### Lubricators

Airborn oil lubricators are the main components of an automatic, continuous system that atomizes oil into a mist and distributes it via the compressed air system to moving surfaces in pneumatic hand tools. The lubricator supplies a constant, clean film of oil to working parts while reducing wearing surface temperatures and cutting oil consumption usually found in manual systems.

Maintenance consists mainly of a visual check of the oil reservoir and replenishment of the supply as required.

### Air Transformers

The filter regulator shown in Figure 3 is a 50-cfm unit used to

Table 1 — Approximate Leak Cost

Opening (in.)	1/16	1/8	1/4
Air Lost (cu ft/mo)	182,000	740,000	2,921,000
Air Cost (\$)	13	52	204

The above figures are based on: 100 psig with nozzle coefficient of 0.65, and \$1.07 per 1,000 cu ft.

clean and regulate air. It features a permanent type cleaner that does not require a replacement filter and uses the air pressure itself to regulate delivered air.

The only maintenance required is an occasional cleaning of the filter and a check of the drain valve to insure free discharge of accumulated water and oil.

### Pipes, Hoses, and Fittings

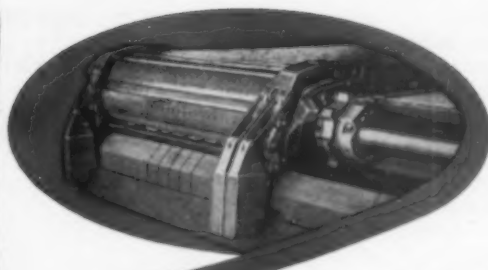
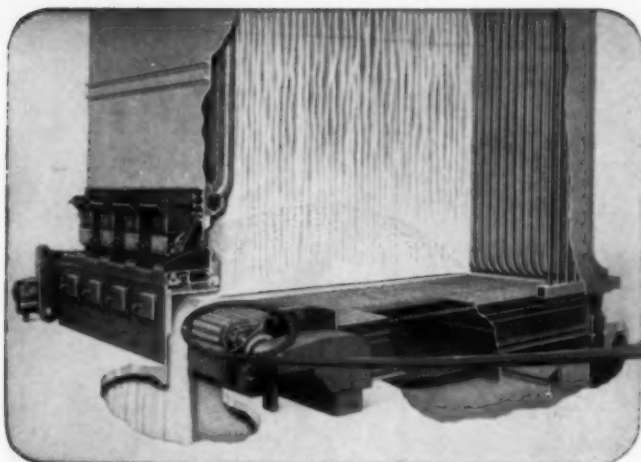
Significant parts of the compressed air system — in addition to the accessory equipment just discussed — are the main pipeline, headers, hoses, valves, and fittings. If reasonable maintenance of these parts of the system is not conducted, loss in the form of air leakage and reduced pressure is sure to follow. A decrease in operating pressure may be attributed to insufficient compressor capacity — when the real fault lies in improperly installed (or leaking) pipes, hoses, and fittings.

Periodic checks for leaks are a relatively quick and easy matter, with results in preventive maintenance far exceeding the effort expended. The most likely places to check for leaks are at pipe joints, valves, hose connections, lines to tools, unions, and other fittings. Table 4 lists approximate leak costs and shows that the monthly cost of even a small leak may not be overlooked.

Methods of checking for correct operating pressures and leaks include use of a hypodermic needle gauge inserted in the line at its operating end while a tool is in use, introduction of a pungent substance into the air system, brushing of soapy water on suspicious areas, and the use of lighted candles or small torches.

### Records

The importance of written records to an effective preventive maintenance program should not be overlooked. The habit of regular inspection is sometimes difficult to establish and the use of check lists, inspection reports and forms will normally be found to



Long grate bars with closely fitting overlay joints prevent leakages. Venturi air openings are spaced to provide uniform air distribution.

## GRATES ARE THE **GUTS** OF A STOKER \_\_\_\_\_ DETROIT ROTOGRADE HAS PLENTY OF INTESTINAL FORTITUDE

No matter what else it has, no stoker can be a complete success without trouble free efficient grates.

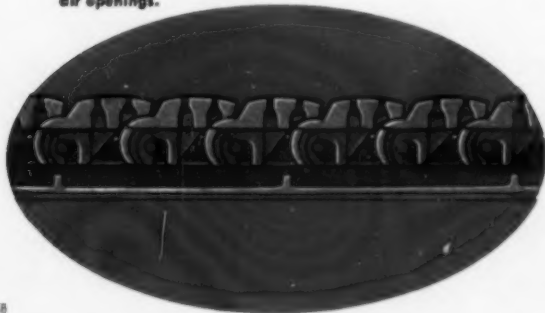
The Detroit RotoGrate Stoker has other outstanding features in abundance but without the superior grate design it could never have achieved such instant and lasting success.

The advent of the RotoGrate Stoker established a whole new trend in coal firing and stimulated many competitors but none has seriously challenged the superior performance and long life of the RotoGrate.

Our grates are high resistance metering type with venturi air openings spaced to provide uniform air distribution. Long grate bars have close fitting overlay joints to prevent leakages that cause blow holes and burnouts.

Sturdy construction and use of special alloy iron makes these grates long lasting under the most exacting service.

Even distribution of air is assured by metering type air openings.



8412

Guide chains riding over toothed sprockets assure positive grate bar alignment. A unique method of attachment avoids chain wear and stretching, while the catenary take up of slack prevents jamming.

Forward travel continuously discharges ash. Automatic combustion control varies the speed of travel in step with fuel feed rate to maintain uniform fuel bed while following fluctuations in load.

Burns all grades of bituminous and lignite coals, also many kinds of refuse and by-product wastes.

The RotoGrate for boilers to 400,000 pounds steam per hour capacity; other Detroit Stokers for capacities from 3,000 pounds steam per hour.

### DETROIT STOKERS COST LESS

Cost equals initial investment plus upkeep plus production losses due to equipment outage. The total is less with Detroit.

**DETROIT**  
SINCE 1898  
**STOKERS**

### DETROIT STOKER COMPANY

DIVISION OF UNITED INDUSTRIAL CORPORATION

MAIN OFFICE AND WORKS • MONROE, MICHIGAN

District Offices or Representatives in Principal Cities

Table 2 — Maintenance Check List\*

CHECK	DAILY	WEEKLY	MONTHLY
<b>Prime Mover</b>			
Coupling			x
Foundation			x
Lubrication	x		
Overheating	x		
Service Manual		x	
Vibration		x	
<b>Compressor</b>			
Air Intake		x	
Bearings			x
Belt Tension		x	
Intercooler	x		
Lubrication	x		
Mechanical	x		
Service Manual		x	
Valves		x	
<b>Accessories</b>			
Aftercooler			x
Receiver			x
Filter		x	
Dehumidifier	x		
Lubricator		x	
Combination Unit		x	
Regulator		x	
Piping, Hoses, and Fittings			x

\*In addition to the items listed above service manuals of all equipment should be checked monthly for special inspection not covered in the above list. All records should be brought up-to-date once a month. And general overhaul of the system and individual equipment should be considered once each year. Also, about every six months you should check for loading of units, and make sure that spare parts are available.

be of assistance.

Table 5 is a form of maintenance check list that, modified to fit a particular installation, may be of help in establishing a system maintenance program.

Inspection records may be attached to major elements of the system, initialed and dated by the inspector, and easily checked by the foreman or maintenance superintendent.

#### Spare Parts

Two additional benefits may be derived from thorough inspection records — they provide the basis for maintaining an adequate supply of spare parts and indicate when a given unit is costing too much to repair and should be replaced.

Checking records for a count of which parts need replacement, and when, will provide parts ordering data. Careful perusal of historical records for a given unit will guide maintenance personnel in recommending a new unit, rather than continued maintenance expense.

#### Summary

Maintenance of the compressed air system begins with the intake

at the compressor and includes all components, pipes and hoses, leading to the points of use.

Preventive maintenance, rather than costly repairs required after

a breakdown occurs, is the key to continued, effective operation of a compressed air system and consists of having properly trained personnel, who are equipped with the correct tools and materials, use approved methods.

Written records, including a comprehensive maintenance check list, assist in establishing an effective maintenance program.



Air Transformer (Courtesy of The DeVilbiss Co.)

## Cheap Temporary Raft

**WE CONTRACTED** for a construction job on an island, and the problem of taking men and materials over was solved with a raft built atop two pontoons that were once fuel gas tanks.

The raft proved sturdy enough to haul trucks and heavy contracting equipment.

By S. CLARK,  
Bradenton, Florida





## Electric Heat Tests Instruments

**TIME AFTER TIME**, electric heat is proving to be the most versatile of all heats when it comes to being applicable to so many different jobs in industry.

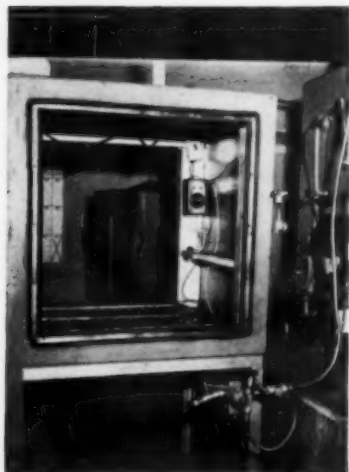
This fact holds true in the case of a famous electronic equipment manufacturer in Florida. This company makes a variety of marine and aircraft electronic controls and aircraft instruments.

The company is currently involved in an Air Force project which requires the most meticulous testing and calibration of altimeters. Until recently, these vital height indication instruments were specified by governmental flight officials to be tested at cold temperatures of minus 35 C. The altimeters' operation at warm temperatures required only their testing at room temperatures.

However, to insure greater safety and more accurate reading of heights of a plane flying over varying temperature zones, new and more strict military specifications for testing were ordered.

These new specifications require the vital instruments to be tested, and compensated, for the varying changes of temperature a military

Here is the specially designed high temperature oven for testing altimeters under various simulated conditions.



## Complete your shop with this modern metallizing installation



**WIRE GUN**

Sprays any metal that can be drawn into wire form.

**POWDER GUN**

Sprays hard-facing alloys and ceramics in powder form.



Without metallizing no maintenance or "job" shop can offer the same complete service as the shop that uses industry's low-cost "putting-on" tool.

With modern, low-cost metallizing equipment you can spray carbon steels, stainless, babbitts, brass, bronze, nickel, aluminum, tin, zinc, special hard facing alloys including tungsten carbide.

- Save up to 90% of replacement costs on machine repair jobs
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- Apply long-wearing, corrosion-resistant coatings

### A real opportunity for the smaller shop

Thousands of large, well-known companies and shops have been metallizing users for many years, not only in maintenance work but in production applications on original equipment. Now, with modern low-cost metallizing equipment this high-speed "putting-on" tool is within the reach of even the smallest shop.



#### FREE BULLETIN

Send off the coupon for detailed information — find out how a metallizing installation can pay for itself in a very short time. No obligation, of course.

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2035 Lafayette St., New Orleans 16, La.

Please send me free bulletin on metallizing.

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**METCO INC.**

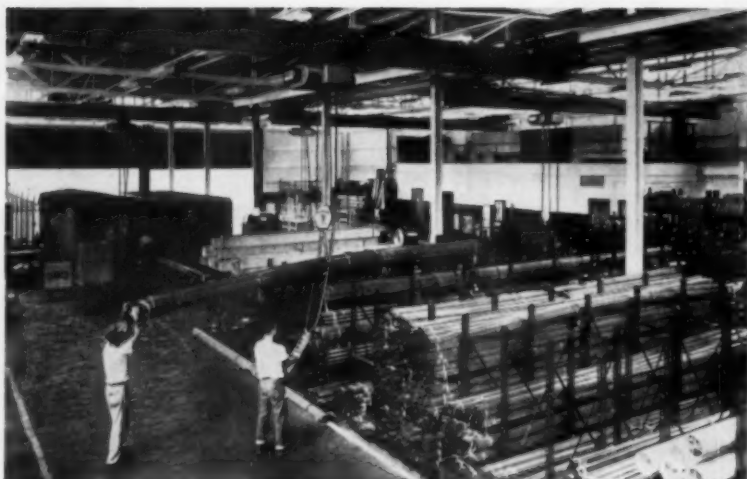
FORMERLY METALLIZING ENGINEERING CO., INC.

*Flame Spray Equipment and Supplies*

2035 Lafayette St., New Orleans 16, Tel EXPRESS 3232

plane can encounter in its flight through areas of extreme temperature change.

To meet this new test requirement, the company designed and built a high temperature oven with glass sides for observation purposes. Three Chromalox strip heaters, along with temperature controls, were installed to provide the heat. For testing, the altimeters are placed in the oven and a great variety of space conditions are simulated for altitudes as high as 80,000 feet. Following the heat testing, the altimeters are adjusted and calibrated as needed for accuracy.



## Cranes Reach Any Area

**A WAREHOUSE** requiring top efficiency in unloading, storage and shipping saves time, effort and valuable storage area by using a network of floor controlled "Load Lifter" crane bridges and cable-type electric hoists with motor

driven trolleys. The four 3-ton crane and hoist combinations, made by Manning, Maxwell & Moore, Inc., make it a simple matter to service the entire 300 foot long, 2-bay, storage area.

As illustrated, two cranes are

installed in each of the 50 foot wide bays. When needed, either crane in one bay can be coupled with either crane in the other bay for fast horizontal transfers from one bay to the other.

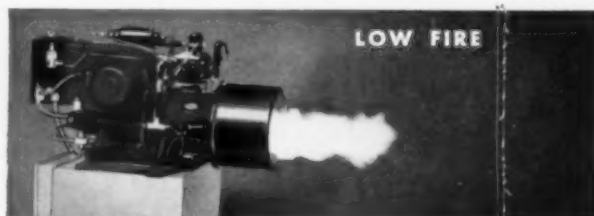
Loads which previously took hours to handle in the old warehouse building are now transported in minutes.

## Burner does a slow burn

for smooth, economical operation

**HEV-E-OIL BURNERS** start with a low fire, a small flame which gradually builds up to the required size for safe, smooth operation. Low fire and high fire are controlled exactly to assure top efficiency over the entire firing range. Moreover, Hev-E-Oil burners furnish all the primary and secondary air needed for efficient combustion. Available from 5 to 150 gph. Also combination gas/oil burners from 720,000 to 21,000,000 Btu.

**HEV-E-DUTY POWER GAS BURNERS** also utilize slow fire build-up for top performance. Air is metered in correct proportion to the amount of gas being used, resulting in high efficiency regardless of chimney draft caused by outside weather conditions. Sizes from 720,000 to 21,000,000 Btu. For more information on Hev-E-Duty Power Gas, Hev-E-Oil and combination burners, write Dept. SPI-90.



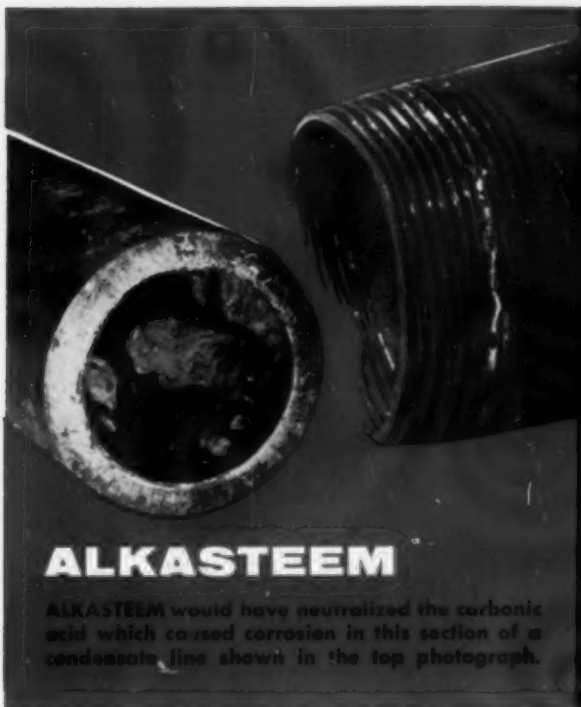
**INDUSTRIAL  COMBUSTION INC.**

EXECUTIVE OFFICE: 4507 N. OAKLAND AVENUE  
MILWAUKEE 11, WISCONSIN

SEE US AT BOOTH NO. 28 — ASHRAE SHOW CHICAGO AMPHITHEATRE — February 13 to 16, 1961

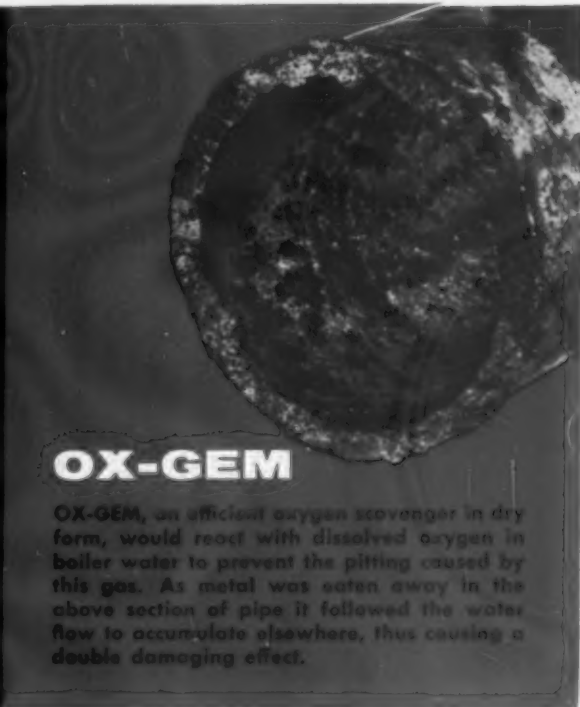
# ALKASTEEM & OX-GEM

prevent corrosion in boilers and return lines



## ALKASTEEM

ALKASTEEM would have neutralized the carbonic acid which caused corrosion in this section of a condensate line shown in the top photograph.



## OX-GEM

OX-GEM, an efficient oxygen scavenger in dry form, would react with dissolved oxygen in boiler water to prevent the pitting caused by this gas. As metal was eaten away in the above section of pipe it followed the water flow to accumulate elsewhere, thus causing a double damaging effect.

## save expensive replacements

You can stop the corrosion in boilers, steam lines, steam traps, valves, unit heaters and return condensate lines. Corrosion is frequently caused by dissolved gases such as carbon dioxide and oxygen. When these gases occur in combination the rate of corrosion is greatly increased. If corrosion is allowed to go unchecked the result, of course, is costly shut-downs for repair and expensive replacements.

Throughout the South, hundreds of engineers rely on ALKASTEEM and OX-GEM and the counsel of Anderson's field service representatives to check these corrosive gases. The life of

equipment is prolonged and the operating efficiency of your system is increased. The Anderson man is a good man to know.

### FREE SURVEY AND ANALYSIS SERVICE

Anderson Service Representatives will be glad to discuss your particular water problems and make recommendations based on an analysis of the makeup water. There is an Anderson representative in your area who will gladly work with you. His services cost you nothing. They can save you much.

*Write, Wire or Phone*

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WATER BEHAVE

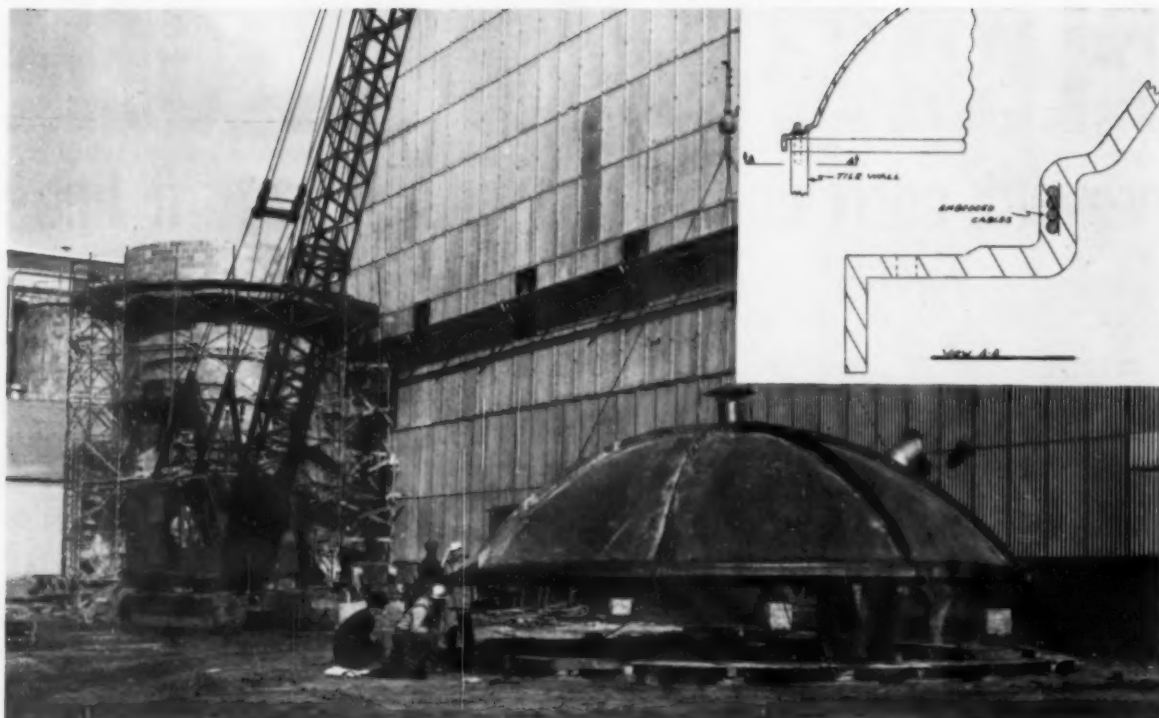


**Anderson Chemical Company, INC.**

Macon, Ga., Box 1424 • Phone Sherwood 5-0466

Memphis, Tenn.: Box 2432, DeSoto Station • Phone: Broadway 2-2806

Dallas 7, Texas: Box 10444, Industrial Station • Phone: Riverside 8-7080



Domed cover is being lifted in place by Rust Engineering Co. workmen.

## Fiberglass Solves Corrosion Problem for Marathon Southern

**FIBERGLASS** reinforced polyester has been utilized by Marathon Southern Corporation in the new addition to its Naheola, Alabama, pulp and paper mill to combat corrosion in a 25-foot diameter broke chest cover. When loads are exerted on the cover, stainless steel cable provides extra reinforcement to hold the polyester laminate in compression, thus taking full advantage of the strongest physical property of the laminates.

Short life span has made previous construction materials costly; their resistance to corrosion has proved relatively poor. To solve the problem, Marathon's Central Engineering Division commissioned Metal-Cladding Inc. to investigate the practicality of glass reinforced polyester resin. The material was found ideally suited from a corrosion standpoint. So it was then necessary to design the strongest possible cover.

The polyester selected is Hetron (R)92, a versatile fire-retardant corrosion-resistant resin produced

by the Durez Plastics Division of Hooker Chemical Corporation. High structural strength, light weight, and ease and economy of fabrication are other important qualities making Hetron well suited for this application.

Metal-Cladding designed a domed cover to combine maximum structural strength with utmost wind resistance. To facilitate shipment to the job site in Alabama, the cover was moulded in eight pie-shaped segments in Metal-Cladding's North Tonawanda plant.

When the segments of the cover were delivered, they were fastened together by a cold bond process, on the ground. Four turns of 3/16" stainless steel cable were then imbedded around the circumference. The outer flange turns down to provide an ideal rain cap.

Eight bolts, one for each segment, were used around the circumference to fasten the cover in place. The bolts were imbedded in the top of the tile chest wall by the tank fabricator. Moon shaped slots

were precut in the segments to allow for any misalignment. After dropping the cover in position, moon shaped washers were secured with nuts to hold down the cover. A hand rasp remedied the single slight misalignment in the entire operation—one slot that was approximately one quarter of an inch off location.

In addition to its properties of corrosion resistance and the extra structural strength contributed by the helically wound stainless steel cable, the cover's translucent quality permits clean-out inspection without the need for lighting facilities. However, such covers can be pigmented easily to reflect sunlight and heat, or to conform to any company's color scheme.

In some cases, heat loss is calculated in the design of a cover. The "K" factor of Kabe-O-Rap, the reinforced polyester, *without* insulation is 1.25. The design lends itself readily to the addition of foam insulation with a "K" factor as low as .25.



## Rectifier for Tennessee Shop

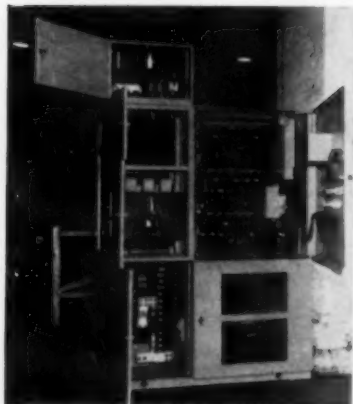
**TYPICAL** of the increasing use of silicon rectifiers for efficient and dependable d-c power control is the Allis-Chalmers 300-kw unit recently supplied the shops of the Clinchfield Railroad, Erwin, Tenn.

This silicon rectifier has certain desirable characteristics for its application at Clinchfield Railroad. Its silicon diodes have virtually unlimited, trouble-free life when operated within their rating. In addition, it has few auxiliary devices, which contributes to reduced maintenance.

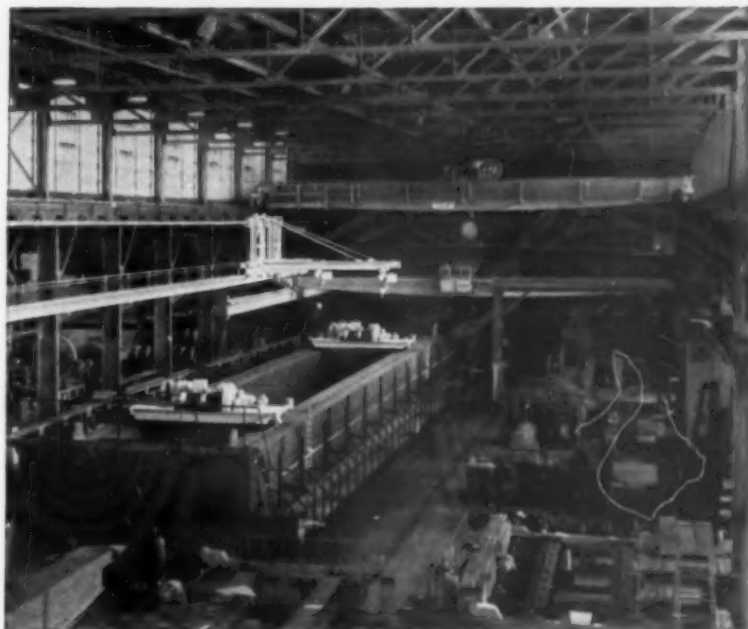
Installation costs of the silicon rectifier are low because the equipment comes in a package and requires no special foundation. It is flexible and can be located near the load center, eliminating the need for long lines.

This 300-kw unit is equipped with a regenerative load absorbing device which protects against rising bus voltage. The regenerative unit throws resistance across the line and cuts in or out automatically at predetermined levels of bus voltage and current.

Diode balancing reactors eliminate the use of matched cells. Fast current limiting fuses assure immediate isolation of a faulted cell without interruption of d-c output. A primary circuit breaker provides quick fault protection and positive overcurrent protection. Efficiency is 95 to 97 per cent between 25 and 100 per cent load.



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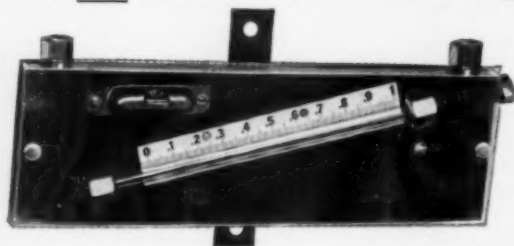


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554 W. MONROE STREET, CHICAGO 6, ILLINOIS

Draft Gages, Bell and Diaphragm—Inclined Draft Gages—Portable Inclined Tube Gages—Vertical Tube Gages, Oil, Heavy Liquid, Mercury, Single and Multi-tube—U-gages, Stationary and Portable—Air Filter Gages, Complete Line—Pitot Tubes—U-Path Steam Calorimeters—Portable Gas Analyzers, Orsat Type—Alarm Systems—Orifice Flanges and Plates—Flow Tube Meters—Condensate Traps.

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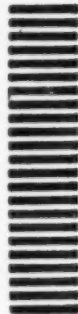
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# NEW Catalogs & Bulletins

... there is always a **BETTER WAY**

## MAINTENANCE—TOOLS EQUIPMENT & METHODS

**27—Corrosion Control Systems**—Brochure 9111 outlines five-step procedure for primary protection and preventive maintenance of all metal surfaces subject to acids, alkalis, solvents, fumes and gases. — TRUSCON LABORATORIES.

**17—Mechanical Packings** — 32 page Cat. PC-103 describes a variety of packings and gaskets, including self-lubricating, sheet and molded packings. Includes application charts and price information. — GREENE, TWEED & CO.

**32—Scale Removal** — Data sheet on Kwik-Kleen, a completely safe method of rapid scale removal for heat transfer surfaces. — THE NORTH AMERICAN MOGUL PRODUCTS COMPANY.

**34 — Floor Maintenance** — 4 page catalog describes metallic, asphalt, latex, epoxy and other products for hardening, resurfacing and patching concrete or wood floors. — A. C. HORN COMPANIES.

**35—Stop Corrosion**—4 page bulletin tells how Alkasteem neutralizes carbon dioxide and Ox-Gem reacts with oxygen to stop corrosion in boilers, heaters, condensate returns, steam lines and traps. — ANDERSON CHEMICAL COMPANY, INC.

**37—Maintenance Gun** — Brochure describes the Von Arx Air Gun — lightweight tool for tough cleaning, de-scaling and de-rusting jobs. Air operated reciprocating needles adjust to contours automatically. Three sizes. Comes in handy kit with accessories. — MARINDUS COMPANY.

**58—Tube Expander Drives** — Bulletin 581 gives data on complete line of Torq-Air-Matic automatic tube expander drives and explains the importance of precision control in tube expanding. Chart to aid selecting right model for the right job. — THOMAS C. WILSON, INC.

**77—Plant Health Aid** — Automatic footsprayer dispenses skin-toughening solution for prevention of athlete's foot. One gal. of solution sufficient for 3,000 treatments. Catalog S-12 gives details. — ONOX, INC.

**64—Zinc Coatings** — Bulletin No. 4 describes Galvanox-Type II (Epoxy) a zinc-rich coating to be used as repair item for damaged areas on galvanized sheets and structures. Provides both cathodic type and barrier protection. — SUBOX, INC.

## FANS—PUMPS—COMPRESSORS HEATERS—HEAT EXCHANGERS

**107—Proportioning Pumps**—4 page brochure illustrates and describes company's proportioning pumps and package chemical feeding units. Includes applications and specifications. — THE BIRD-ARCHER CO.

**112—Airfoil Bladed Fans** — Series 116, Centrifugal Type for broad range of general ventilation and industrial process applications from Class I through Class III with lowest possible first cost. Bulletin A-1103, 60 pages, gives engineering details. — AMERICAN-STANDARD.

**154—Chemical Feeders** — Bulletin 202, 4 pages, illustrates and describes the Ful-O-Feeder chemical system for continuous heavy duty service. — FULBRIGHT LABORATORIES, INC.

**165—After Cooler** — Bulletin 130 shows how the Aero unit removes moisture from compressed air or gases; cools water for jackets and intercoolers; cools air or gases in both power and process systems; and protects air tools and pneumatic systems from water damage. — NIAGARA BLOWER COMPANY.

**182—Centrifugal Fan Equipment** — Catalog 515 covers complete, ready-to-run centrifugal fan equipment. Capacities 400 to 14,000 cfm. V-belt and direct drive units. Universal discharge feature. Available for outdoor installation. — CLARAGE FAN CO.

**190—Centrifugal Pumps** — Bulletin 1 — Gives a condensed listing of all types of centrifugal pumps for every service, including capacity, pressure and head range for each type. A quick reference on centrifugal pumps from A to Z. — PACIFIC PUMPS, INC.

## INSTRUMENTS—METERS CONTROLS—REGULATORS

**205—Draft Gages** — Bulletins describe inclined, vertical tube, air filter gages, straight line and dial pointer type, minified draft and receiver type gages, velocity gages and pitot tubes, gas analyzers and steam calorimeters. — ELLISON DRAFT GAGE CO.

**213—Meters & Controls** — Bulletin G15-1 describes and illustrates systems and instruments used in the measuring, transmitting, receiving, interpreting and controlling of 18 variables normally encountered in power plant and industrial plant

operation. — BAILEY METER COMPANY.

**222—Pressure Regulators** — Catalog No. 77 illustrates and describes application, operation and specifications for a complete line of reducing, back-pressure and pump-pressure regulators. — MASON-NEILAN.

**225—Cooling Controls** — Self-powered controls for compressors, stills, solvent coolers, degreasers and small engines are described in Bulletin 710; operational and hook-up sketches. — SARCO COMPANY, INC.

**244—Desuperheaters** — 4 page Bulletin 1024-A describes steam-assist desuperheating. Charts show the close control of temperature which is possible during wide load fluctuations. Schematic diagrams of piping arrangement and control systems. — COPES-VULCAN DIV.

## KEEP UP-TO-DATE USE SPI READER SERVICE

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**267—Remote Liquid Level Indicators** — Bulletin RI-1825 describes indicators for pressures up to 3000 psi — advantages, operation and specific installations. — YARNALL-WARNING COMPANY.

**281—Diaphragm Control Valves** for accurate control of pressure-temperature and liquid level described in Catalog J-170. Designed specifically for instrumented process systems requiring linear flow characteristics and tight shut-off. — OPW-JORDAN.

## PLANT CONSTRUCTION—WELDING EQUIPMENT—SPECIALTIES

**304—Backing Rings** — Bulletin 56-2 describes rings for fast economical fit-up in piping, tubing fittings and valves. Shows how rings assure uniform complete-penetration welds and ease of handling in shop and field. Carbon steel, wrought iron, chrome alloys, stainless, aluminum and copper. — ROBSON BACKING RING COMPANY.

**309—Fiberglass Panels** having 20-year guarantee on panel color and light transmission characteristics are lowest-cost glazing you can buy

## Bulletins (Cont.)

on cost-per-year basis. Stylux-20 is shatterproof; provides up to 90% light transmission; does not pit or erode. Use for windows, skylights, sun shades, etc. — BUTLER MANUFACTURING COMPANY.

**316—Drainage & Construction** — Catalog Gen-10658 gives data on products for industrial uses, including corrugated metal pipe, paved-invert pipe, Asbestos-Bonded pipe, Multi-Plate pipe, pipe arches, perforated pipe, and water control gates. — ARMCO DRAINAGE & METAL PRODUCTS, INC.

**330 — Elevated Water Storage** — 4-color catalog describes the Aquatore — a new elevated water tank design with capacities from 300,000 to 3,000,000 gallons. Many design advantages including no struts or tie-rods. — GRAVER TANK & MFG. CO.

**357—Mechanical Lubricators** — Various force feed mechanical lubricators, accessories and components available for lubrication systems described in Bulletin L-60. — MANZEL.

**365—Storage Water Heaters** — Gas-fired, Scalefree 230 units described in Bulletin 4. Fully automatic package requires only simple connections. Available in more than 100 storage and recovery combinations. Storage capacities range from 250-4000 gal. — THE PATERSON-KELLEY CO.

### PIPING—VALVES—FITTINGS STEAM SPECIALTIES—TRAPS

**402—Forged Steel Valves**—General Purpose Valves, Supplement No. 1 to Catalog F-9, covers gate, globe and angle valves, ½" through 2" sizes, for 150-800 pound service. Featuring 13% chrome stainless steel trim with hard facings. — HENRY VOGT MACHINE CO.

**410—Flexible Connectors**—How all-metal connectors absorb piping vibration described in Catalog 1D-100C. Convey corrosives, simplify misaligned hookups, and save installation time. Bronze, carbon steel and stainless steel. — UNIVERSAL METAL HOSE CO.

**411—Steam Trap Book** — 48 page manual reviews importance of good trapping. Gives complete data on traps and strainers. Contains complete selection, installation, testing and maintenance information. Many useful tables and charts. — ARMSTRONG MACHINE WORKS.

**414—Acid Resistant Pipe** — 4 page technical brochure covers properties of Union 20-S stainless steel. Alloy can be welded and put into service without subsequent annealing. Shows comparative resistance to 94 different corrosive agents. — REYNOLDS ALUMINUM SUPPLY CO. — UNION STEEL CORP.

**415 — Steam Trap** — Bulletin No. 455-B describes the Float-Thermostatic steam trap with its entire operating element in one unit mak-

ing it removable without disturbing inlet and outlet connection to the semi-steel trap body, suitable for 125 psi steam pressure. — SARCO COMPANY, INC.

**465—Water Hammer**—Cause, effect and control covered in Bulletin 851. — THE WILLIAMS GAUGE CO., INC.

**468—Steam Traps** — 40 page engineering manual aids engineers and maintenance men in sizing, specifying and buying of steam traps and other fluid specialties. All data necessary to engineer a trap installation is included. — V. D. ANDERSON CO.

### BOILERS—STOKERS TURBINES—BURNERS

**504—Steam or Hot Water** for power, process or heat highlighted in 20-page catalog AA-2. 20 through 600 hp units, fuel burning equipment and controls, service data, and available outdoor type enclosures detailed. — AMES IRON WORKS, INC.

**505—Refractories** — Paco High Heat Duty and Super Duty Plastic Refractories. Fire brick, high temperature cement, castables. Installation and engineering service. Free estimates and inspection. — NORTH STATE PYROPHYLLITE CO.

## KEEP UP-TO-DATE USE SPI READER SERVICE

See pages 69 & 70

**507—Packaged Water Tube Boilers** — Descriptive catalogs detail 10 outstanding features including six-wall furnace cooling, insulated double-steel casing, manway in every drumhead, and tangent tubing providing "solid walls of water" on four sides of furnace. — SPRINGFIELD BOILER COMPANY.

**515—Packaged Steam Generators** — Bulletin PSG-2 describes factory assembled portable type units from 10,000 lb/hr to 40,000 lb/hr capacities. Gives construction details and dimensions. In standard pressures of 175, 250 and 375 psi. — HENRY VOGT MACHINE CO.

**523—Soot Blowers**—Bulletin 1030 describes Vulcan T-30 retractable soot blowers, available in lengths up to 38 ft. Includes sectional drawings and special design features. — COPES-VULCAN DIVISION.

**536—Automatic Boiler-Burner Unit** — Assembled plant (Scotch-type, two-pass) for all heat or power applications; for low pressure or high pressure use; burner to match for heavy oil, light oil, or combinations of gas/light or gas/heavy oil. Easy maintenance. Bulletin SPI-100 gives details. — INDUSTRIAL COMBUSTION, INC.

**542—Underfeed Stoker** — Illustrated Cat. 401 gives complete data on double retort underfeed stoker built for heavy duty service in intermediate size range for boilers of 20,000 lb to 34,000 lb of steam/hr capacity. — DETROIT STOKER CO.

**546—Stoker-Fired Packaged Generators** — Bulletin PG59-4 describes semi-automatic units available in 3 standard sizes: 43,000, 50,000, and 63,000 lb/hr steam capacity at pressures to 250 psig. Can be converted to oil firing in matter of hours. — FOSTER WHEELER CORPORATION.

**553—Boiler Start-Up**—Bulletin 1048 describes a moving temperature probe which patrols critical boiler gas passages and gives adequate warning of incipient hot spots during lighting off. Includes structural details and specifications of probe as well as explanations of operating features and methods of control. — COPES-VULCAN DIVISION.

**555—Package Air Preheater** — 14 page booklet tells how you can install this package unit at fraction of expense required for conventional heat recovery equipment. Fast and easy installation offering long term fuel savings. — THE AIR PREHEATER CORP.

**565—Self-Contained Boilers**—8 page brochure AD-162 describes line of Model CB boilers. Highlights design features, fuel flexibility, four-pass, forced draft design, unified electric and steam preheater, quiet vibrationless impeller, and hinged doors with built-in refractory. — CLEAVER-BROOKS CO.

**566—Packaged Combustion Unit** — Completely piped, wired and tested factory assembly described in Bulletin B8/30. Has Kinetic gas burner, manual firing valve, automatic diaphragm gas valve and electronic combustion safeguard system incorporating RA680 cabinet. Available in 3 sizes with 8 capacities from 800,000 to 3,260,000 Btu/hr. — WEBSTER ENGINEERING CO.

**569—Pressure Atomizing Oil Burner** — The new Type C-45 burner for use with economical heavy commercial No. 4 and No. 5 fuel oils described in Bulletin 100. — NATIONAL AIROIL BURNER COMPANY, INC.

**594—Packaged Boiler** — Ten outstanding features of new positive flow model in 5 sizes (50-100 hp) include ease of operation and accessibility. Bulletin 1275 gives engineering details. Oil-gas and combination fired. New burner design. — ORR & SEMBOWER.

### ENGINES—DRIVES POWER TRANSMISSION MATERIAL HANDLING

**600—Mechanical Shaft Seals**—Chempro mechanical external seal described in Bulletin CP-551. First seal designed for complete interchangeability with packing. No mounting clamps, machinery stuffing box faces or drilling holes. Install in 30 min. Adjust after installation. — CHEMICAL & POWER PRODUCTS, INC.

**614—Vertical Transportation** — Catalog A-382 describes and illustrates details of passenger and freight elevators and escalators, for use in all types of industrial plants.—OTIS ELEVATOR CO.

**615—Dial Scales** — Catalog gives specifications on dozens of standard and special types for industry. Accessories for printed weight records and remote weight indications.—THE HOWE SCALE CO.

**618—Casters & Wheels** — Featuring "Lockweld" steel casters without a king-pin, Cat. C-57 describes full line of industrial wheels manufactured and distributed from Rome, Ga. plant.—THE FAIRBANKS CO.

**620—Shaft Couplings** — Bulletin 98 describes various applications of full-floating shaft couplings, used to connect shafts that are spaced far apart.—THOMAS FLEXIBLE COUPLING CO.

**627—Variable Speed Fluid Drives** for blowers, fans, pumps, compressors, etc., detailed in 20 page Bulletin A-719. Features of the Gyrol fluid drive include no load starting, power savings, simpler and better control.—AMERICAN-STANDARD.

**641—Belt Conveyors** — Cat. ID-591, 88 pages, shows principal belt conveyor products, including heavy duty and standard roller bearing and precision ball bearing idlers. Engineering Data section contains simplified and condensed information for proper selection.—CONTINENTAL CONVEYOR & EQUIPMENT CO.

#### **WATER TREATMENT—HEATING & AIR CONDITIONING—DUST & FUME CONTROL—REFRIGERATION**

**700—Peak Load Problems?** — Keep your air conditioning and refrigeration systems operating at maximum efficiency during peak load months. Catalog tells how Anco treatment removes rust and scale and kills slime and algae in equipment.—ANDERSON CHEMICAL COMPANY.

**712—Ion Exchange** — Bulletins discuss Two-Bed De-Ionizers and Mixed-Bed De-Ionizers, with photos to illustrate plant applications and diagrams to show operation.—ILLINOIS WATER TREATMENT COMPANY.

**716—Dust Collection** — Whether nuisance elimination or process material recovery, check on Whirlx Dust Collector Units. Engineering data available.—THE FLY ASH ARRESTOR CORP.

**719—No Frost Refrigeration** — Bulletin 105 describes with diagrams and photographs method used for food freezing, chilling and warehouse refrigeration on largest scale without frost or ice formation, insuring full capacity and uniform temperature.—NIAGARA BLOWER CO.

**720—Power Roof Ventilator**—4 page Bulletin 550 illustrates and describes Centrator, the centrifugal power roof ventilator with the ex-

clusive "jet siphon." Includes capacity and dimension tables.—CLARAGE FAN CO.

**723—Fly Ash Collection** — Catalog 103 tells how "Double Eddy" goes to work to increase boiler fly ash collection. Buell Cyclones will not clog or plug even with loadings up to one pound of ash per cu ft of gas.—BUELL ENGINEERING COMPANY, INC.

**724—Chemicals & Services** — Water treatment chemicals and engineering services for The Industrial South-Southwest highlighted in 12-page Bulletin 5000-A. Specific products and their functions detailed.—DEARBORN CHEMICAL COMPANY.

**726—Filters** — Automatic valveless gravity filter described in 8-page Bulletin 4351. Includes design features and installation details.—PERMUTIT.

**737—Water Treating Plan** — Separate bulletins combine in folder to form "A Complete Water Treating Plan" for boiler feedwater and cooling water treatment. Leaflets cover various aspects of treatment and equipment.—DEADY CHEMICAL COMPANY.

## **KEEP UP-TO-DATE USE SPI READER SERVICE**

See pages 69 & 70

**748—Stop Fungal Decay** — Bulletin MT-58 describes preservative wood treatment for cooling towers, pinpoints organisms that destroy effective performance and prescribes treatment that arrests these destructive organisms, as well as the application techniques.—THE MARLEY COMPANY.

**756—Refrigeration Problems?**—VMC compressors, intercoolers, chillers, described in Bulletin 817 — design improvements, protective devices and factory-run-in-tests.—THE VILTER MANUFACTURING COMPANY.

**757—Boiler Water Treatment** — Data sheets P-101 through P-107 summarize products and their application.—FULBRIGHT LABORATORIES, INC.

**761 — Water Treatment Equipment** —Aeration, degasifiers, chemical feeders, precipitation equipment, filters and ion exchange equipment described in Bulletin 4447. Simplex meters, flow controllers, and air valves included.—PERMUTIT.

**794 — Refrigeration Compressors** — Bulletin 112-J describes the applications and specifications of heavy-duty compressors for all types of refrigeration service. Pictures many typical installations and uses.—FRICK CO.

#### **ELECTRICAL**

**803—Power Control** — Bulletin describes design, manufacturing and consulting services for motor control centers; switchgear; power centers; specialty, mechanical and automation control requirements.—POWER CONTROL COMPANY.

**855—Wiring Analyzer** — 4 page bulletin describes Model 301 Adequate Wiring Analyzer which quickly, simply and easily tests wiring without confusing calculators or slide rules.—SPRAGUE ELECTRIC COMPANY.

**871—Electrical Protection** — Handbook tells how to select protective devices for circuits, motors and apparatus. Condenses all '59 Code references covering protection problems. Explains how installation costs can be cut and space saved with Dual-Element fuses.—BUSSMANN MFG. DIV.

**874—High Voltage Rubber Cables**—32 page catalog contains information on design features, insulations available, and performance highlights of company's butyl rubber power cable, Durasheath. Also data on kinds of available constructions from 600 v to 15,000 v conductors.—ANACONDA WIRE & CABLE CO.

**880—Electrical Test Kit** — Amprobe literature describes Test-Master Kit — all equipment you need for electrical testing jobs.—PYRAMID INSTRUMENT CORP.

**885—Electrical Maintenance** — File 21 tells how to set up good electrical testing program — insulation resistance testing, motor and phase testing cable fault location.—JAMES G. BIDDLE CO.

#### **Late Bulletins**

**N-1—Water Hardness** — Bulletin HSP-903, 4 pages, describes procedures, reagents and equipment for one-minute water hardness tests, and explains adaptations of titration method.—HALL LABORATORIES, Hagan Center, Pittsburgh 30, Pa.

**N-2—Bronze Bushings** — Bulletin, 4 pages, lists twenty popular SAE brass and bronze alloys, their chemical composition and physical properties.—THE MARKEY BRONZE BUSHING COMPANY, Delta, Ohio.

**N-3 — Valve Actuators** — Bulletin VA-10, 4 pages, covers a newly developed hydraulic valve actuator suitable for a variety of applications, and includes ordering information.—OIL-DYNE, INC., 2115H W. Marquette Road, Chicago 36, Ill.

**N-4 — Cold Coatings** — Pamphlets T-197 1, 2, 3, present an inhibitive primer; a modified coal tar emulsion coating; and a heavy-bodied emulsion material which combines coal tar protection with adhesive properties.—KOPPERS COMPANY, Tar Products Division, Pittsburgh 19, Pa.

(Continued on page 85)





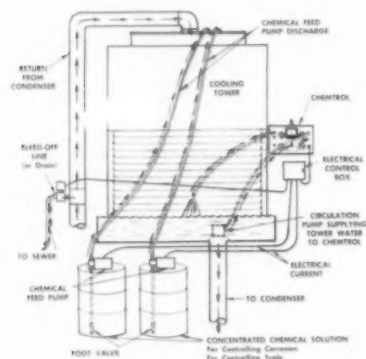
## NEW Product Briefs

... there is always a **BETTER WAY**

### FOR MORE INFORMATION ON FOLLOWING ITEMS Fill in Code Number on Return Card — Page 69

#### Tower Water Control

**B-1** Water Services Inc., 7213 Kingston Pike, Knoxville 19, Tenn., has announced a new automatic control for treatment of cooling tower water through continuous analysis and prompt application of proper corrective measures. This electronic device, known



as Chemtrol, is adaptable to any size unit, in any location and to any type water. It controls pH, prevents scale, controls corrosion and eliminates algae — all simultaneously, completely automatically and economically.

A small circulating pump, positioned for correct sampling of water, supplies water continuously to the analyzer for testing. As water conditions change, Chemtrol either adds chemicals to maintain proper concentrations in a desired range (holds pH to plus or minus .05 of the desired setting), or bleeds the required amount of water from the tower to hold dissolved solids within 40 parts per million — all automatically. As load conditions or water quality change, the instrument automatically makes any changes required to maintain desired conditions.

#### LPG Engine Oil

**B-2** A custom-engineered lubricating oil blended specifically for liquefied petroleum gas and natural gas engines is announced by **Lubrication Engineers, Inc.**, 2809 Race Street, Fort Worth, Tex.

It is available in weights from SAE 10 to SAE 50. Advantages include: unusually high heat resistance to prevent excessive oxidation; lower sulphur content; greater lubricity through the blending of 100 per cent selected paraffin base stocks; more constant viscosity; and less carbon build-up.

#### Conveyor System

**B-3** A new system for storing as well as conveying parts is now being engineered and manufactured by **Mathews Conveyor Co.**, Ellwood City, Pa. The



system is adaptable to nearly any industrial application where solid materials can be conveyed on a horizontal plane.

Multiple carriers make possible the storage of thousands of small parts and feeding them into operations or assembly locations at a speed to meet production requirements. By using 90 degree turns, the "Live-Flo" system can often be used as a sole means of conveyance, starting with the raw material and continuing through shipping.

#### Elapsed Time Meter

**B-4** A new elapsed time meter (Type BH-351), with or without reset knob and mounted from either the front or back of the panel, is available from



the **Westinghouse Electric Corporation**, P. O. Box 2099, Pittsburgh 30, Pa.

Since the meter indicates the total time that a particular circuit is energized, it is suited for such applications as tube replacement programs and maintenance scheduling of electrical equipment, including diesel generators, motors, welders, and radio and television transmitters. Six register wheels are provided, giving indication up to 99,999.9 hours.

#### Epoxy Enamel

**B-5** **E. I. du Pont de Nemours & Company**, Wilmington 98, Del., announces that ready-mixed epoxy enamel for maintenance coating on surfaces and equipment exposed to alkali and acid fumes is being introduced by its industrial maintenance finishes sales section under the trademark of "Corlar."

Epoxy ester paints offer an order of chemical resistance between the catalyzed epoxies and alkyds, thus competing with air-dry phenolic and chlorinated rubber compositions.

A single-package material, the new ready-mixed epoxy enamel elim-



inates mixing in the field as well as the problem of the limited pot life of catalyzed epoxy formulations.

In addition to a high level of chemical resistance, it has good durability in salt air exposure, persistent condensate, and moisture. It stands up well under the destructive action of alkaline machine tool cutting oils.

"Corlar," available in white and nine colors, is easy to apply by brush, roller, or spray. It dries tack-free in six hours and is recommended by Du Pont for wood, masonry, and metal.

### Insulation Tester

**B-6** A new portable high voltage insulation tester, with a continuously adjustable output of zero to 5000 volts rms, has been introduced by the **Opad Electric Company**, 43 Walker Street, New York 13, N. Y.



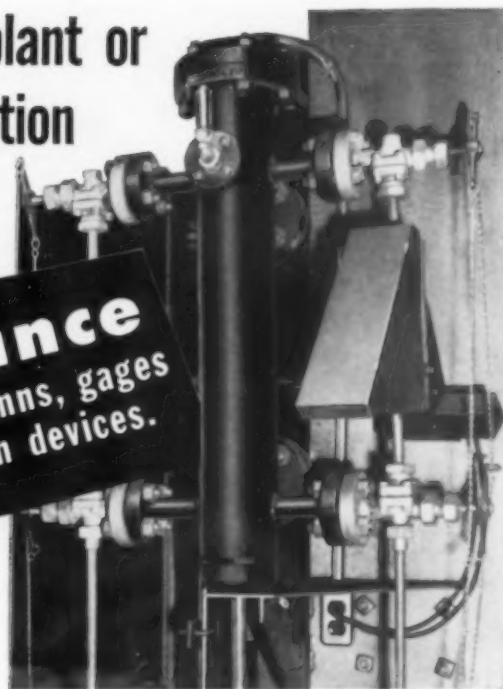
Designated as Model HV53, this compact instrument features a calibrated transistorized high voltage circuit breaker with a continuously settable trip point between 10 ua and 3000 ua. Leakage current in excess of the preset value immediately disconnects the high voltage from the test specimen, illuminates a "Leakage" indicator lamp and sounds an alarm.

The unit is arranged for either manual, foot switch, or high speed remote control operation and either automatic or manual resetting after a leakage overload. A panel selector switch provides for guarded or unguarded testing. The panel meter has a scale length equivalent to a conventional 4½" instrument and is connected to the output side of the transformer.

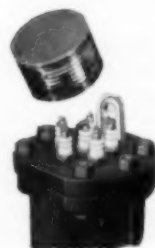
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...you'll be wise to select...

**Reliance**  
water columns, gages  
and alarm devices.



Reliance  
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Remote Gage



Reliance  
**LEVALARM**  
Electrode-type  
control

Plan wisely for completely safe water level supervision on all boilers, and all water-containing vessels, with rugged, efficient Reliance equipment. This specialized line includes water columns for any type of boiler — any pressure — and complete trim, including various types of gage valves and inserts, direct-to-drum assemblies and illumination; remote reading gages, auxiliary alarms and automatic controls.

Two most valuable *additions* to your present equipment are the EYE-HYE — safe, sure *manometric* remote reading gage — and the several LEVALARMS which provide instant control of alarms, fuel cut-out and pump operation. If not acquainted with them, write for literature.

Known the world over for accuracy, sturdiness and dependability, Reliance equipment brings you the advantages of trouble-free low-maintenance service. For keeping your plant in the best of trim now, or for planning new or revised power facilities, keep posted on the latest in Reliance Boiler Safety Devices.

Reliance Levalarm EA-100 is a useful float-operated device to set off electric warning signals for low or high water levels in tanks. Can also be used as fuel cut-out control.



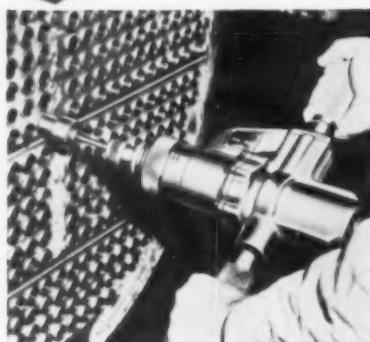
The Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland 3, Ohio

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**BOILER SAFETY  
DEVICES**

# AIRETOOL

job-fitted pneumatic tools for better tube maintenance . . .



Proper tube fabrication and maintenance depend on the right equipment for each job. And Airetool's complete line of air-powered tools and accessories are job-fitted to specific needs; to cut down time, boost in-service life and speed tube repair and replacement.

**AIRETROL** (illustrated above). Positive, automatic tube expansion control that's accurate within .001 inch. Rolls up to 12 tubes a minute.

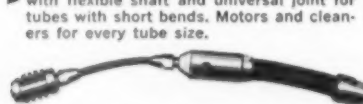
## CC-475 condenser cleaner

cleans out stubborn deposits; a built-in flushing system cools drill head and removes cuttings.

## INTERNAL TUBE CUTTER

with positive feed control for cutting tubes of 12 to 20 gauge.

**EXPANDING BRUSH HEAD CLEANER**  
with flexible shaft and universal joint for tubes with short bends. Motors and cleaners for every tube size.



For further information, write:



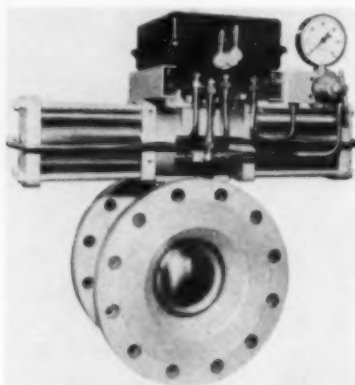
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European Plant: Vlaardingen, The Netherlands  
Canadian Plant: Brantford, Ontario

## New Product Briefs (Continued)

### Valve & Positioner

B-7

According to the **Jamesbury Corporation**, Worcester, Mass., the Bailey positioning relay, used in conjunction with the Jamesbury ball valve and pneumatic operator, provides an excellent means for automatically controlling the flow of media through pipe lines.



The relay, manufactured by the **Jamesbury Corporation** of Cleveland, Ohio, serves as a throttling device that automatically positions the valve to any desired rate of flow. It translates the signals from the controller to a pneumatic impulse that acts upon the valve itself.

The Jamesbury ball valve is especially designed to mechanically calibrate flow from 0° to 90°.

### Aluminum Switch Bases

B-8

**Reynolds Metals Company**, Richmond 18, Va., announces that electrical air break switch bases can be made less expensively, lighter and more rigid by using aluminum. The bases now are being incorporated by **I-T-E Circuit Breaker Company** of Greensburg, Pa., into their standard 115 kv air break switch line, and Reynolds presently is developing a complete series of bases for switches from 7.5 kv to 340 kv.

To fabricate the base, a single aluminum extrusion is cut to length. Bolt holes are punched out, both top and bottom, at the same time. The extrusion is made with an interlocking configuration and it is necessary only to put one extrusion end into another and weld them together.

This box design results in a superior base rigidity which does a better job of taking torsional loads caused by short circuits. It also allows installing switches with a greater overhang at point of attachment.

These factors plus the natural qualities of aluminum — its resistance to corrosion, 70 per cent less weight and maintenance free performance — make the new switch base an important improvement.

### Motor De-Greaser

B-9

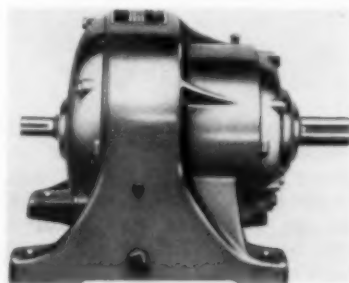
**Industrial Supply Division, Sprayon Products, Inc.**, 2075 E. 65th St., Cleveland, Ohio, is offering a de-greaser specially designed for electrical equipment.

Sprayon No. 701 is easy to use, and comes in a 16-oz aerosol can. No washing or flushing is needed. It is simply sprayed on and wiped off. It penetrates quickly, loosens dirt, liquefies heavy greases and tars. It is non-corrosive, non-staining, non-toxic. It will not damage insulation and is non-flammable.

### Speed Reducer

B-10

**U. S. Electrical Motors Inc.**, Box 2058 Terminal Annex, Los Angeles 54, Calif., has developed double reduction speed reducers incorporating an im-



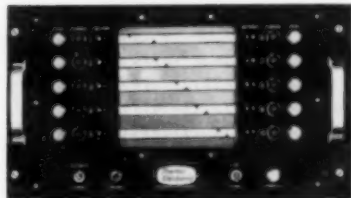
proved gear arrangement for low speed, high torque, extra capacity working performance.

The "Syncrogear" speed reducers are provided in two types of gear train construction, depending on rating of the unit: Type GDO with normal double reduction gear train; and type GLO, also double reduction, but with a duplex gear arrangement. Suited for applications with space limitations, type GLO uses two primary gears and two final pinions to share the load from

high speed pinion to slow speed output gear. Fully hardened, helical gears give maximum speed reduction and eliminate gear breakage caused from heavy duty loads.

### Electronic Controller

**B-11** A new electronic multi-point temperature controller has been developed by **Thermo Electric Co., Inc.**, Saddle Brook, N. J. It provides automatic two-position control for up to ten



separate processes and can be used as a single point controller, a five-point three-position controller and a manual-balance indicator. Any points not being used for control of a multiple-temperature process can monitor other processes.

The controller combines a sensitive null-balance potentiometer measuring circuit with an electronic control system. It is adaptable to any installation requiring off-on control. Accuracy is 0.5% of range. Calibrated range scales are available for all standard thermocouple materials. Standardization is continuous by means of a highly stable constant voltage supply unit.

### KEEP UP-TO-DATE USE SPI READER SERVICE

See pages 69 & 70

### Bronzed Bushed Idlers

**B-12** Bronzed bushed idlers in 14 standard sizes are now offered by **Brewer Machine and Gear Co.**, 1441 North 2nd St., St. Louis, Mo.

All idlers have 1 inch standard bores. Sprockets are made in all standard sizes for No. 35 through No. 80 roller chains in both single and double widths. Pulleys are made in 1, 2 and 3 inch face widths with 4 inch diameter and are used with vee, flat, and timing belt drives.



## No Scale Problem!

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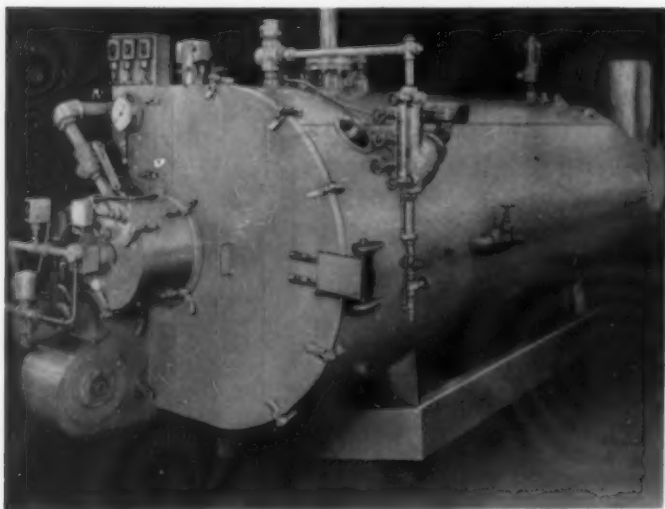
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## New Product Briefs (Continued)



### Positive Flow Boiler

**B-13** Orr & Sembower, Inc., Reading, Pa., is introducing a new packaged automatic firetube boiler of unusual design and outstanding performance.

Designated as the Powermaster Positive Flow (Model PF), it has burner and furnace located on the left side at the horizontal center line of the boiler. It is of three pass design with no tubes directly above or below the furnace, thus avoiding any impediment to the natural circulation flow. The side located furnace was found to provide the most efficient circulation of water of any of the many designs tested.

The circulation pattern is comparable to that in a watertube boiler. It develops as relatively cool water is directed down through the third pass, following the normal downward movement of natural circulation to the bottom of boiler, then rising through the second pass and around the furnace.

In addition to the positive circulation, the side located furnace eliminates danger of heat damage due to stagnant water and sludge at the bottom of the boiler. It also makes all fireside and waterside surfaces easy to inspect and permits design of turn-around spaces to be simple and accessible, with positive sealing assured.

Hinged front cover can be opened for access to heating surface in less than two minutes without disturbing burner, wiring or piping. No bolts are used. The rear cover is divided for easy accessibility and

maintenance.

Back construction is available with either standard dryback or optional wetback. The dryback design employs a new type pre-fired high-temperature refractory liner, backed with a lightweight insulating material. The refractory provides high resistance to flame and maximum insulating qualities to the rear cover, assuring minimum refractory maintenance. The liner may be replaced in the field, if necessary.

The air supply system is built into the front casing of the boiler, and achieves economy through preheating as well as giving the unit a smooth, easy-to-keep-clean front.

One of the most important developments incorporated in the new boiler is the new O&S PyroFlow burner, which contributes materially to the outstanding performance. It can be easily converted in the field to burn either oil or gas without burner modification. The burner on the oil-fired model is a low-pressure internal mixing air-atomizing type. Models are also available with steam atomization for applications having 40 psi or higher steam pressure.

The new boiler is to be produced in five standard sizes: 50, 60, 70, 80 and 100 horsepower, all sizes available in oil-fired, gas-fired and combination-fired. Hot water and steam atomization models will also be available in all five sizes.

For More Free Data FILL IN CODE NO. on the Handy Return Card — Page 69

### Vinyl Coating

**B-14** Amercoat Corporation, 4809 Firestone Blvd., South Gate, Calif., has developed a high-build vinyl coating for application with either conventional or airless spray equipment. The new Amercoat No. 99 is not a mastic, yet it overcomes the application disadvantages of most vinyls, which require multiple coats to achieve minimum protective thickness. As a result, substantial savings are being obtained on material and labor required to provide lasting protection against industrial, chemical, petroleum and marine corrosion.

When applied with airless spray equipment, only one cross-sprayed coat is required to obtain a dry film thickness of more than 5 mils. Using conventional spray equipment, only two coats are required to produce a dry film thickness of 5 mils. It may be applied over organic primers. The coating dries to a hard and tough matte finish which adheres firmly and resists abrasion. Non-flammable, odorless and non-toxic, it will not harbor bacteria or fungi.

### Drill Press

**B-15** A new 17-inch drill press line has been introduced by the Walker-Turner Division, Rockwell Manufacturing Company, 400 N. Lexington Ave., Pittsburgh 8, Pa.

Design permits stopping of the pinion at any pre-set depth within the full 5-in. spindle travel range. A depth gage, calibrated down to 1/16 in. and magnified 2:1 for easy





reading, is attached.

According to the manufacturer, this depth stop completely eliminates quill, spindle and cutting tool deflection. It also does away with hard-to-adjust stop nuts.

For More Free Data FILL IN CODE NO. on the Handy Return Card — Page 69

## Water Analysis

**B-16** A new instrument that provides continuous on-stream analysis of water has been introduced by Hagan Chemicals & Controls, Inc., Hagan Center, Pittsburgh 30, Pa.



The "Chemonitor" duplicates continuously and automatically the principles of colorimetric analysis, thus determining and recording the amount of a specific component in water. A sample is piped into the instrument and mixed with reagents. When silica is present, the sample turns blue. The intensity of the color is then measured by the colorimeter and the measurement recorded on a recorder. When desired, the recorder operates an upper-limit switch that in turn actuates an alarm system.

In the zero to 300 parts per billion silica range, the instrument permits detection of concentrations as low as 5 ppb with plus or minus 2 ppb accuracy. Typical applications are analysis of boiled water, condensate and effluents from demineralizers, water softeners, and waste disposal treatment plants.

# FOR STEAM PROCESS EFFICIENCY WE RECOMMEND



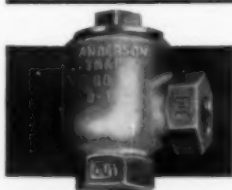
## Super-Silvertop INVERTED BUCKET TRAPS for:

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Coffee Urns	Fat Work Ironers	Steam Purifiers
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Corrugated Paper	Hot Water Heaters	Submerged Surfaces
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Drain Pans	Pipe Coils	Unit Heaters
Dress Forms	Presses	Vacuum Cannery
Drips	Sock Forms	Warmers

## Heat-Kwik COMBINATION TRAPS for:

Autoclaves	Kettles	Submerged Surfaces
Cooking Kettles	Rendering Cookers	Tempering Apparatus
Dryers	Retorts	Unit Heaters
Expellers	Slashers	Water Heaters

or wherever fast heating up is desired



## Quik-Flex THERMOSTATIC STEAM TRAPS for:

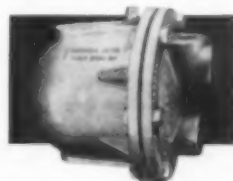
Autoclaves	Expellers	Slashers
Cooking Kettles	Kettles	Sterilizers
Dryers	Retorts	

or wherever fast heating up, or outside freeze-proof installations are required.

## Anderson FLOAT TRAPS for:

Air Purifiers	Air Separators
Gas Purifiers	Gas Separators
Condensate Flow Meters	Air Receivers
False Water Line Sewers	Gas Receivers
Master Trapping	Gas Scrubbers
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or wherever continuous discharge is necessary



Anderson has no "axe" to grind. With a complete line of traps we provide an honest recommendation for all your trap problems. Write for your free book "How to Select Steam Traps" . . . written to give you an unbiased opinion in answer to all your steam trap difficulties.



## SUPER SILVERTOPS STEAM TRAPS BY THE MANUFACTURERS OF HI-eF PURIFIERS

THE V. D. ANDERSON COMPANY

Division of International Basic Economy Corporation  
1966 West 96th Street • Cleveland 2, Ohio

## New Product Briefs (Continued)

### Tube Expansion Control

**B-17** The Airetool Manufacturing Company, Springfield, Ohio, has developed a new high-speed pneumatic tube expansion control for steel or non-ferrous tubes through  $\frac{3}{4}$ " in size.



The Model 900 Airetrol is lighter in weight than the standard model and features a quick-reversing handle. Tubes can be rolled at the rate of 12 per minute to uniform accuracy of within .001 of an inch. The control automatically stops expansion according to a predetermined dial torque setting. This accuracy results

in uniformly tight tube joints, and there is no under or over expansion. Motor and torque sections are separate and self-contained, providing easy maintenance.

### Refractory Cement

**B-18** Johns-Manville Corp., 22 East 40th St., New York 16, N. Y., is marketing a new ready mixed, air setting refractory cement. Called Super Blakite, it was developed as a refractory coating for use over vertical boiler tubes.

The material is furnished in a stiff consistency for use as a trowel coating and is directly applied from the container. Because of its workability, high strength, and good adhesion, it can be applied to smooth metal plates that are directly overhead. On applications of one-inch thickness, it will not crack or dry when subjected to heating.

In addition to boiler uses, the cement can be used for laying fire clay brick and super duty brick when thinned with water to the

proper working consistency. It can also be used for shallow, cold patching of refractory masonry, and for coating the inside surfaces of duct linings subjected to flue dust abrasion.

### Braided Packing

**B-19** Garlock Inc., 457 Main St., Palmyra, N. Y., announces that a new production process makes it possible to market Teflon impregnated braided packing at greatly reduced prices.



Designated Garlock style 5875, the white asbestos braided packing contains more than 30% Teflon by actual weight. This type of packing has widespread application on rotary and centrifugal shafts, valve stems and expansion joints and reciprocating rods, plungers and rams. It has a temperature range from -90 F, to +500 F, and its low coefficient of friction reduces wear to the packing and to mechanical components during start-up and operation. It remains unaffected by moderately destructive and corrosive minerals, acids and caustics.

The packing is available in  $\frac{1}{4}$ " through  $\frac{3}{4}$ " sizes in  $\frac{1}{16}$ " increments in either spool, reel or ring form.

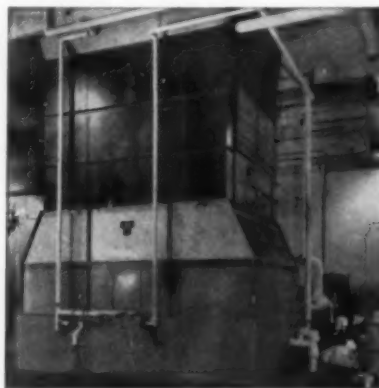
## WHEREVER YOU NEED TO COOL A FLUID... and have a problem of water supply or disposal... use NIAGARA "AERO" HEAT EXCHANGER

► Evaporating a very small amount of water in an air stream you can cool liquids, gases or vapors with atmospheric air, removing heat at the rate of input, controlling temperature precisely. Save 95% of the cost of cooling water; save piping, pumping and power. You quickly recover your equipment cost.

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vapors, cool water, oils, solutions, intermediates, coolants for mechanical, electrical or thermal processes. You have a closed system free from dirt. You have solved all problems of water availability, quality or disposal, maintenance expense is low.

You may apply this to solvent recovery, vacuum systems controlling reactions, condensing distillates, cooling reflux products.



For more information, write for Bulletins 120, 124, 135. Address Dept. SP-8.

## NIAGARA BLOWER COMPANY

Dept. SP-2, 405 Lexington Ave., New York 17, N. Y.   
Niagara District Engineers in Principal Cities of U. S. and Canada

### Control Cable

**B-20** A new industrial control cable with chemically cross-linked polyethylene insulation has been announced by General Electric's Wire and Cable Department at Bridgeport, Conn.

The new "Vulkene" combines electrical properties similar to those of polyethylene with thermal properties superior to those of heat-resistant conventional rubbers, either natural or synthetic.

The result is a cable with improved heat stability and excellent electrical characteristics, better chemical resistance than provided by plastics, and smaller diameters than afforded

by rubber. Since the cable has a high overload rating, much of the concern that generally prompts engineers to recommend the use of circuit protective devices on control circuits is removed.

The cable is designed for general usage in air, conduit, underground ducts, or for direct burial. It is especially useful for high-ambient temperature applications. The cable can be spliced and terminated in the same manner as any other thermosetting type. It is available with a 600-volt or 1000-volt rating in two through 12 conductors.

## KEEP UP-TO-DATE USE SPI READER SERVICE

See pages 69 & 70

### Temperature Control

**B-21** A recording impulse-type thermostatic control for electrical heating equipment has been announced by the **Partlow Corporation**, 544 Campion Road, New Hartford, N. Y.

This proportioning recorder-controller is designed for use where



process temperatures are critical and overshoot (or undershoot) cannot be tolerated. It also is recommended for applications where the capacity of the electrical heating elements is large in relation to the work load.

The Model RES provides variable electric input to the equipment, so that changes in temperature produce proportional changes in heat input. Current is supplied in timed impulses by means of a constantly ro-



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**N**othing protects iron and steel from rust better than zinc. And nothing applies zinc better than hot-dip galvanizing.

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## PERFECT SEAL Unions

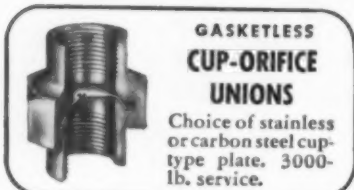
HOT FORGED from solid, rectangular steel bars, designed and produced for dependable, long-life service under the severest piping conditions!

**A TYPE FOR EVERY USE!  
FOR ALL PRESSURES!  
FOR ALL TEMPERATURES!**



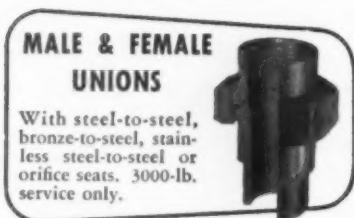
**Standard & Double  
Extra Heavy  
UNIONS**

Available with screwed or socket weld ends. 3000-lb. sizes  $\frac{1}{8}$ " to 3"; 6000-lb. sizes  $\frac{1}{8}$ " to 2".



**GASKETLESS  
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Choice of stainless or carbon steel cup-type plate. 3000-lb. service.



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With steel-to-steel, bronze-to-steel, stainless steel-to-steel or orifice seats. 3000-lb. service only.



**FULL STAINLESS &  
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With screwed or socket weld ends. 3000-lb. and 8000-lb. service.

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showing the complete Catawissa  
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## New Product Briefs (Continued)

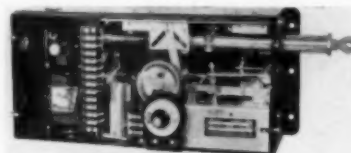
tating cam which cycles a snapping switch in the control circuit.

As a result, the time-temperature curve of a process controlled by the Model RES closely approximates a smooth line, rather than the saw-tooth line characteristic of two-position control. After the control has found a heat input rate which balances the process requirement, the time-temperature line becomes flat. Normal modulating range is 8 per cent of scale range.

that is cast integrally in the top of the motor frame; the power leads are also brought into the chamber through an epoxy-sealed connector.

### Metering Components

**B-23** **Cleveland Controls, Inc.,**  
1111 Brookpark Road,  
Cleveland, Ohio, has introduced a new line of controllers, actuators, transmitters, indicators



and manual stations for control of fuel and air in combustion processes.

The basic transmission system is electronic. The flow regulator has a built-in, field adjustable cam, characterized by simply turning a series of Allen-head adjusting screws. Any point on the cam can be adjusted, or re-adjusted to its original setting, at any time. Another advantage is a "Duo-Fuel cam," available for combination gas and oil fired boilers. Positioning and metering systems for a wide variety of single and multiple boiler installations can be designed by the proper combinations of components.

## KEEP UP-TO-DATE USE SPI READER SERVICE

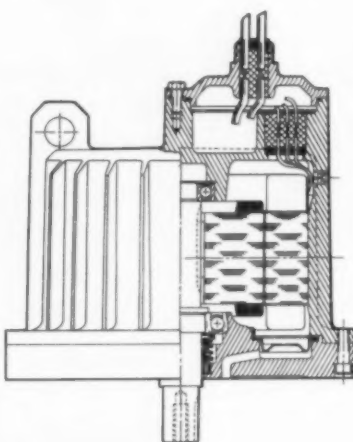
See pages 69 & 70

### Glass-Protected Stacks

**B-24** Colored, glass-protected smokestacks are a recent development by the Atomic and Process Equipment Division, **A. O. Smith Corporation**, Milwaukee 1, Wis. Fusing glass to steel increases stack life up to three to five times. Green, red, gray, tan, brown, black, light blue and royal blue colors to blend with the architectural decor of any industrial plant are now fused into the stack exterior. Savings result from eliminating the standard practice of painting and repainting. Extreme temperature and weather

### Submersible Motor

**B-22** A new line of submersible a-c motors has been introduced by **Reliance Electric and Engineering Company**, 24701 Euclid Ave., Cleveland 17, Ohio. The pressure-proof motors, especially designed for close-coupling to centrifugal pumps operating in any depth



of water, oil or liquid chemicals, are available in sizes from  $\frac{1}{2}$  through 40 horsepower for operation from polyphase power sources, and from  $\frac{1}{4}$  through 5 horsepower for single-phase connection.

The motors are rated at 55 C temperature rise for 30-minute duty in 40 C air, and for continuous duty in 40 C liquids.

Of exclusive "Liqui-Seal" construction, the submersible motors are oil-filled to give total protection against bearing wear. They never need additional lubrication.

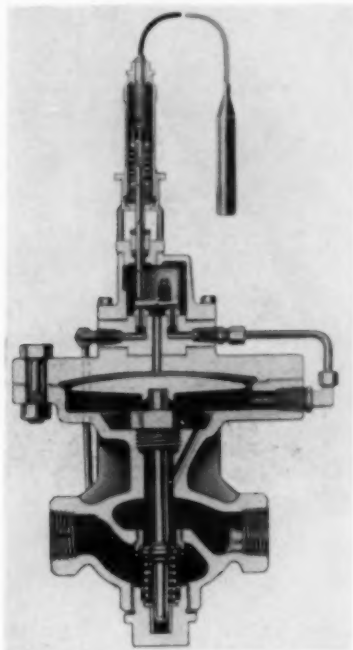
A reconnectable dual-voltage feature is available on single-phase units from  $\frac{1}{4}$  through 2 horsepower, and on all polyphase motors. Motor leads are brought from the stator into an epoxy-sealed air chamber



conditions have little or no dulling effect on the glass-protected stacks and corrosion and rusting are no longer a problem. Glass-protected smokestacks are available in a variety of sizes. A typical section is 20 feet long, height depending on customer requirements. Stack diameters range up to eight feet, in six-inch increments.

### Temperature Regulator

**B-25** Leslie Co., 230 Delafield Ave., Lyndhurst, N. J., announces a complete new line of temperature regulators for storage type heating and cooling applications.



The "Eventemps" are single seated, self-contained units, diaphragm actuated with a lever-type internal pilot. There are only two moving parts in the regulator body. The regulator has a pressurized, self-cleaning, friction-free teflon stem seal and tight closing, positive seating main valve. Trim parts can be inspected or renewed without removing the body from the pipe line.

Temperature variations are sensed by a liquid filled thermo-element which is interchangeable when the regulator is on line. A number of different thermo-elements, spans and bulb materials are available.

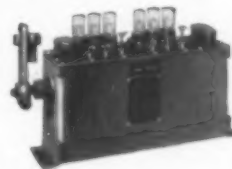
The regulators are designed for either continuous or standby service.

## HOW TO educate



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Just put it through a Manzel force-feed lubricator and any oil drop knows where it's going and how to get there fast. Manzel lubricators deliver just the right amount of oil to bearings, cylinders and packings. They start, stop, speed up and slow down in perfect synchronization with your machinery...unaffected by high steam, gas or air pressure. Whatever your field, there's a Manzel lubricator to meet your needs. For our catalog, write Manzel, 257 Babcock Street, Buffalo 10, New York. Whatever your lubricating problem, you get the right answer if you



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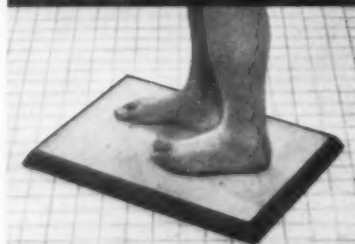
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Footsprayer cuts cost to 1/10 cent per treatment



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Skin specialists say the best way to prevent Athlete's Foot is to increase the skin's resistance to fungus growth\*. That's what Onox does. It keeps your feet as tough and healthy as your hands. Used by clubs, schools, and over 70% of the largest U. S. companies for the treatment and prevention of Athlete's Foot.

\*American Pub. Health Assoc., Oct. 15, 1954

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If not satisfied, you owe us nothing. Full details on request.

### ● FREE FOLDER

Write for "Facts on Athlete's Foot" including medical opinions.



## New Product Briefs (Continued)

### Hydraulic Relief Valves

**B-26** As a companion line to the machinery hydraulic check valves introduced recently, **Parker-Hannifin Corp.**, 17325 Euclid Ave., Cleveland 12, Ohio, announces new pilot operated relief valves.

The relief valves have been engineered for a minimum 5-to-1 safety factor over rated operating pressure. The line mounted type valves are for 3000 psi hydraulic systems, while the gasket mounted units are rated at 5000 psi. Both series are provided in rated capacities of 20 and 50 gpm. Subplates are offered for use with the gasket-mounted type.

## KEEP UP-TO-DATE USE SPI READER SERVICE

See pages 69 & 70

### Ultrasonic "Micrometer"

**B-27** Equipped with a newly developed caliper attachment, a "Sonoray" ultrasonic flaw detector may now be used to measure thickness of metals and plastics, from one side, to accuracies within  $\pm 0.010$  inch. Both the caliper



attachment and the basic instrument are marketed by **Branson Instruments, Inc.**, 40 Brown House Road, Stamford, Conn.

Operation of the caliper is simple. It consists essentially of a fixed, scribed, vertical line, and a second line on a slider, movable across the face of the cathode ray tube. A synchronized dial indicator measures the amount of this motion, permit-

ting the operator to determine thickness directly, without calculations or interpolation. The caliper attachment is available separately, for mounting on existing Sonoray detectors, or it may be ordered installed on the instrument. It weighs approximately one pound.

### Ball Valve

**B-28** The R-P&C Valve Division, **American Chain & Cable Company, Inc.**, Reading, Pa., has introduced a newly designed ball valve.



The BL-300, rated at 300 pounds for water, oil or gas service at a maximum temperature of 250 F, is available in sizes  $\frac{1}{2}$ " to 2" inclusive. It is fast and easy to operate, since it requires only a quick quarter turn of the handle to open or close. The precision-built valve is for general purpose service, at a cost no more than a high quality standard bronze gate valve. Positive sealing in either flow direction makes it ideal for vacuum service. The perfectly machined ball combines with the "automating" seats for smooth positive operation. The Buna "N" seats are impregnated with molybdenum disulphide to give a slippery, non-galling surface. Two "O" ring stem seals assure a leak-proof stuffing box. The body, cap, stem, disc and ball are made of naval bronze.

## Bulletins

(Continued from page 73)

**N-5—Cooling Tower Control**—Chem-trol Bulletin, 4 pages, describes a new device for automatic, electronic, continuous, analysis and control of cooling tower treatment. — **WATER SERVICES INC.**, 7213 Kingston Pike, Knoxville 19, Tenn.

**N-6 — Unit Heaters** — Bulletin DB4-101, 4 pages, covers line of horizontal and vertical steam unit heaters, with addition of two new sizes to replace old ones. — **ILG ELECTRIC VENTILATING CO.**, 2850 N. Pulaski Road, Chicago 41, Ill.

**N-7—Coagulation Chemicals** — Bulletin A1, 8 pages, discusses chemistry of coagulation applied to effective water treatment, practical approaches to problems, and solutions. — **NALCO CHEMICAL COMPANY**, 6216 W. 66th Place, Chicago 38, Ill.

**N-8—Metering Systems** — Bulletin MS-360, 24 pages, describes equipment for proportioning of fuel and air in industrial combustion processes. — **CLEVELAND CONTROLS, INC.**, 1111 Brookpark Road, Cleveland 9, Ohio.

**N-9—Lubricated Valves** — Bulletin No. V-218, Rev. 2, 8 pages, provides complete instructions for lubricating and servicing Rockwell-Nordstrom valves. — **ROCKWELL**

**MANUFACTURING COMPANY**, Meter & Valve Division, 400 N. Lexington Ave., Pittsburgh 8, Pa.

**N-10—Centrifugal Pumps** — Circular No. 184, 12 pages, charts recommended temperature and pressure ranges for ten classifications of pumps, and gives other selection data. — **DEAN BROTHERS PUMPS INC.**, 323 W. 10th St., Indianapolis 7, Ind.

**N-11—Overhead Handling** — Booklet No. 2008-Q, 12 pages, features carriers, cranes, tractors, track switches, grabs, and electrification systems for overhead material handling. — **THE CLEVELAND CRANE & ENGINEERING CO.**, Wickliffe, Ohio.

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**N-12—Protective Coatings** — Bulletin No. T-97-61, 8 pages, presents solution to corrosion and deterioration problems, covering nine Bitumastic products. — **KOPPERS COMPANY, INC.**, Tar Products Division, Pittsburgh 19, Pa.

**N-13—Packaged Boilers** — Bulletin No. 1275, 4 pages, presents Powermaster positive flow Model PF packaged automatic boilers, designed for ease of operation, dependability and accessibility. — **ORR & SEMBOWER, INC.**, Reading, Pa.

**N-14 — Control Valves** — Catalog J170-1, 8 pages, contains engineering information on sliding gate and plate control valves for steam, water, air, oil, gas and chemicals. — **OPW-JORDAN**, 6013 Wiehe Road, Cincinnati 13, Ohio.

**N-15—Power Tools** — Catalog, 92 pages, describes industrial power tools and accessories, giving specifications, catalog listings, and photographs. — **ROCKWELL MANUFACTURING COMPANY**, Delta Power Tool Division, 483 N. Lexington Ave., Pittsburgh 8, Pa.

**N-16—Overhead Conveyor** — Form 2365, 6 pages, introduces the Rapistan power and free overhead trolley conveyor, designed for flexibility in material handling. — **RAPISTAN-KEYSTONE, INC.**, 21750 W. Eight Mile Road, Detroit 41, Mich.

**N-17—Pneumatic Actuators** — Bulletin B-1020-7, 4 pages, covers pneumatic spring and diaphragm actuators available in complete valve assemblies to customer specifications. — **CONOFLOW CORPORATION**, 2100 Arch St., Philadelphia 3, Pa.

**N-18—Large Volume Storage** — Cylindroid Folder, 4 pages, offers a new concept in large volume storage by means of a tank form of unlimited capacities and dimensions. — **GRAVER TANK & MFG. CO.**, East Chicago, Ind.

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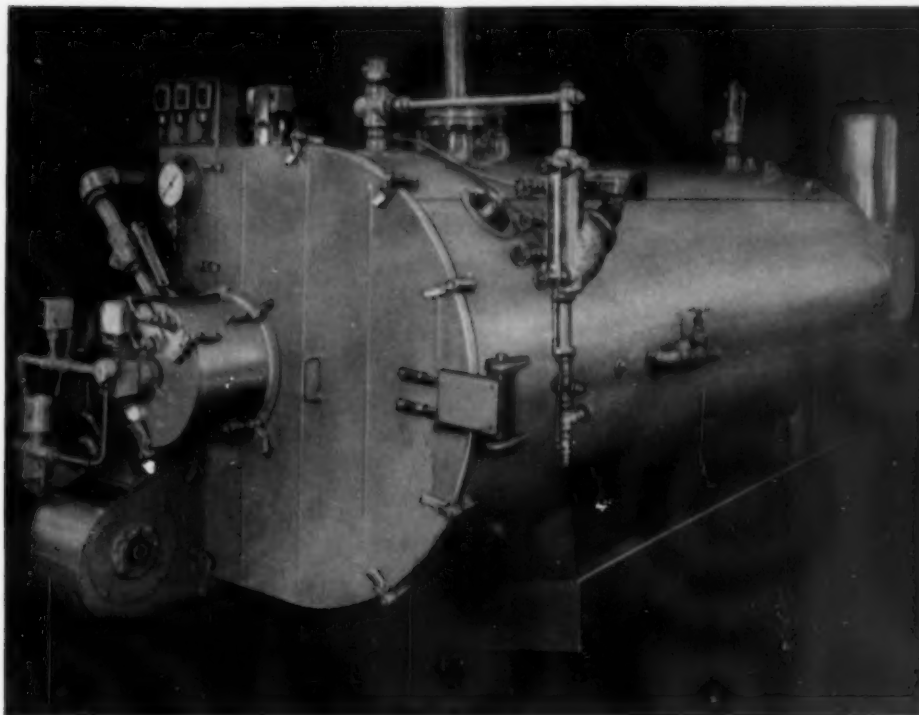
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**...the greatest advance in packaged  
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No other boiler can match the performance of the *Powermaster Model PF* for generating steam or hot water economically and dependably. A comparison of performance tests with other boilers will prove this is no idle statement.

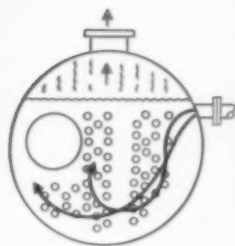
See a demonstration of this highly advanced boiler at the International Heating & Ventilating Exposition in Chicago, Feb. 13-16, Booth 207, or write for Bulletin No. 1275. A leasing arrangement may be made with your local O&S distributor.



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PACKAGED AUTOMATIC BOILERS



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Design permits boiler feed injection and natural thermal circulation to augment each other. This provides the maximum water circulating rate and the most efficient form of heat transfer, *counterflow*.



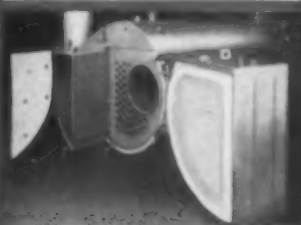
### SIDE LOCATED FURNACE

Side located furnace eliminates danger of heat damage due to stagnant water and sludge. Turn-around spaces are simple, accessible and positive sealed.



### HINGED FRONT COVER

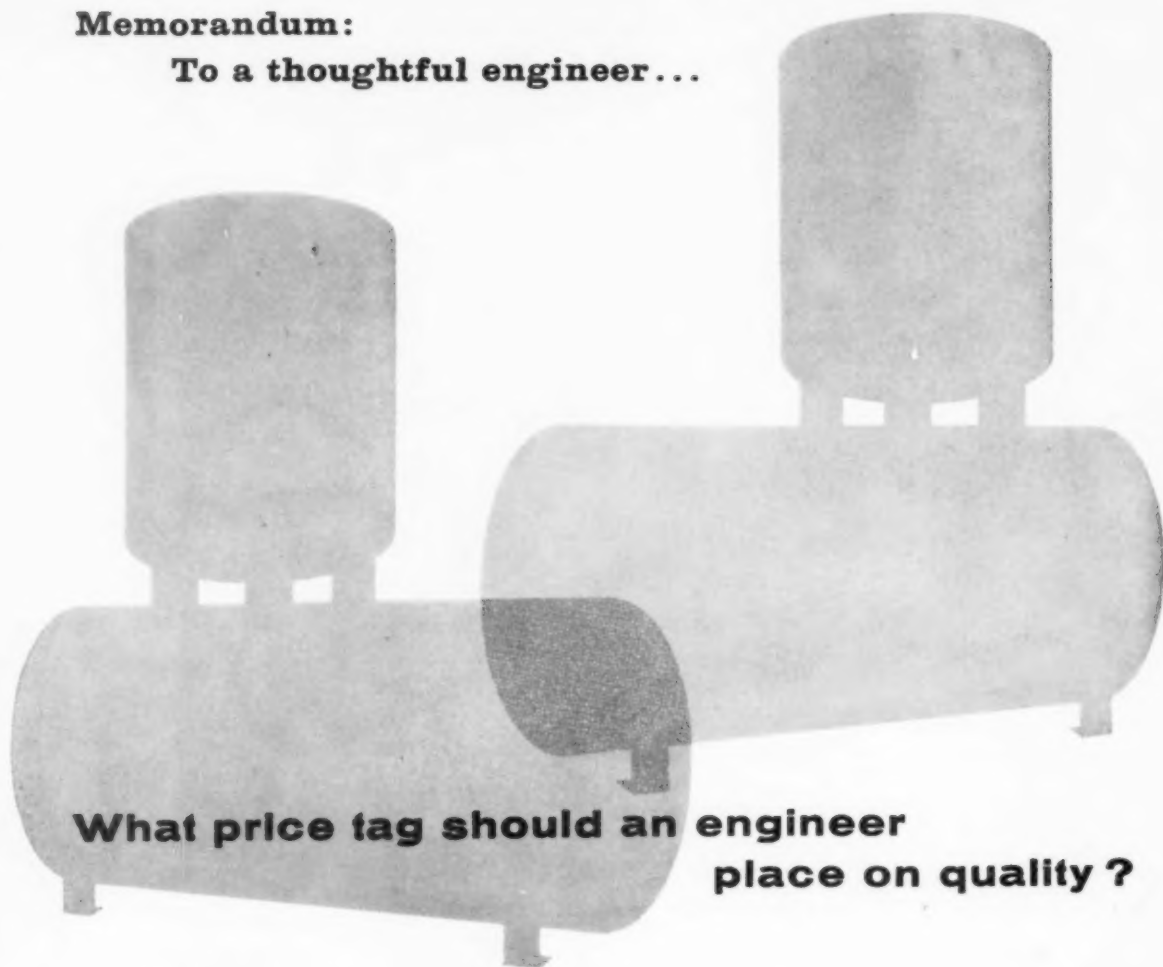
Hinged front cover, with quick-opening fasteners (no bolts) can be opened for access to heating surface without disturbing burner, wiring or piping.



### DIVIDED REAR COVER

Hinged rear cover, also with quick-opening fasteners, permits ease of accessibility and maintenance. Each cover section forms a separate seal in a single plane, providing protection from short-circuiting of combustion gases. No internal baffles to leak.

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Write for these five bulletins on Deaeration—the problem, types of deaerators and applications.

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